THE

Poona Agricultural College Magazine.

VOL. XIX.] JULY 1927. [NO. 1.

"Industry need not wish and he that lives upon hope will die fasting."

V. G. DESHPANDE, B. Ag.
N. S. MENON, B. A.
Editors.

PRICE As. 10.

Printed at the Aryabhushan Press, Poona City, by ANANT VINAYAK PATVARDHAN, and published by D. G. KULKARNI, at the Poona Agricultural College, Poona.

CONTENTS.

THE

Poona Agricultural College Magazine.

VOL. XIX.] SEPTEMBER 1927. [NO. 2.

"Our duty is to advance the prosperity and the well-being of the cultivators of India, one of the most important and potentially powerful agricultural communities of the world."

MARQUISS OF LINLITHGOW, D. L.
Chairman, Royal Commission on Agriculture.

V. G. DESHPANDE, B. Ag.
N. S. MENON, B. A.
Editors.

PRICE As. 10.

Printed at the Aryabhushan Press, Poona City, by ANANT VINAYAK PATVARDHAN, and published by D. G. KULKARNI, at the Poona Agricultural College, Poona.

CONTENTS.

THE

Poona Agricultural College Magazine.

VOL. XIX.]　　DECEMBER 1927.　　[No. 3

We want vision, we want enterprise, and we must abandon old and beaten Paths which have paralyzed effort in the past.

V. G. DESHPANDE, B. Ag.
N. S. MENON, B. A.
Editors.

PRICE As. 10.

Printed at the Aryabhushan Press, Poona City, by ANANT VINAYAK PATVARDHAN, and published by D. G. KULKARNI, at the Poona Agricultural College, Poona.

CONTENTS.

THE

Poona Agricultural College Magazine.

VOL. XIX.] FEBRUARY 1928. [NO. 4.

Nature does not allow us to explore her Sanctuaries all at once, we think we are initiated, but we are still on the threshold.

V. G. DESHPANDE, B. Ag.
N. S. MENON, B. A.
Editors.

PRICE As. 10.

Printed at the Aryabhushan Press, Poona City, by ANANT VINAYAK PATVARDHAN, and published by D. G. KULKARNI, at the Poona Agricultural College, Poona.

CONTENTS.

THE POONA

AGRICULTURAL COLLEGE MAGAZINE.

VOL. XIX.] JULY 1927. [No. 1.

EDITORIALS.

This Magazine now enters upon its nineteenth year. Though it is not yet out of its "teens" it is just on the border and practically it has attained majority. Taking this fact into consideration probably and thinking that the ward does not stand in need of any vigilant care of a senior guardian Rao Bahadur Professor D. L. Sahasrabuddhe resigned his office as the Editor-in-Chief (Staff-Editor) of this magazine. During his regime not only the tone of the magazine but also the financial state of it has been considerably improved. Our sincerest thanks are due to the retiring Staff Editor for conducting the magazine so ably. Though he has severed his connection, we are sure we can still rely on his help whenever it is needed.

* * * *

Our magazine is growing in popularity which can be well evinced from the steady increase in the number of subscribers. Still it is far less as compared to the number of readers, past students, and the interested public. We therefore take this opportunity of requesting all those interested to enlist themselves as subscribers, to freely contribute, to make suggestions for making it more useful and in every way to actively take part in helping it to further the cause of agriculture.

* * * *

Along with other books for review and opinion we have received a Farm-Report from a private cultivator and Land-lord. We are not going to use this space for critically reviewing it, but in mentioning it we only wish to bring it to the notice of our readers who are enganged in private farming that they will kindly make

it a point to publish their experiences and difficulties through this journal. The faithful record of such information will not only be interesting but most instructive to those who are and will be engaged in private farming in so far that they will get new ideas and be warned against the dangers and pit-falls which they will try to avoid.

* * * *

This seems to be the age of exhibitions as it is considered to be the best vehicle for Propaganda or the best machine for broad-casting information to the public. Immediately after the grand Presidency Agricultural show—the first in the Series—preparations were begun for the next show in Gujrat at Ahmedabad for the Gujrat Division. It will be opened in coming December and the Leaflet No. 1—(included elsewhere) issued by the General Secretary in that connection, will clearly give the idea and scope of the exhibition.

* * * *

There is observed for the last two or three years a great deal of rush for admission to the Agricultural College, so much so, that admission had to be stopped for want of accommodation. Is it due to the growing popularity of this kind of Education or to the reputation of our College or to the Biological necessity arising out of the unemployment menace? We leave it to the public to judge. May it be due to any cause, it is not going to affect the Agricultural interest, but on the contrary it will help its cause.

* * * *

The peculiar feature of the admissions of this year is that a lady student has sought admission and has been admitted. The field-practicals and the manual work being not so compatible with weak persons, it is considered as a new departure-almost even adventure on the part of the lady student. We congratulate her on her steadfastness of purpose and commend her for her choice.

* * * *

We are glad to welcome once again among our midst Mr. V. G. Gokhale, Deputy Director of Agriculture, Konkan as acting Professor of Agriculture during the leave vacancy of Prof. B. S. Patel proceeding to Australia. Simultaneously with his coming here Rao Bahadur P. C. Patil went on leave for two months and Prof. Gokhale has been appointed as acting Principal. We offer our hearty congratulations to Prof. Gokhale on his appointment.

HAPPINESS.

(Address by Rao Bahadur D. L. Sahasrabuddhe, to the B. Ag. Students—31st March 1927).

For some years past, it has been the custom in this College for the Principal and the members of the staff to meet the out-going students at a tea party. It has also been the custom to have a short speech on behalf of the staff and another on behalf of the students. The duty of making a speech on behalf of the staff has, this year, fallen on me and I accept it with the greatest pleasure.

My young friends, we have been together these three years. We as teachers have tried to give you what knowledge we possess on the subjects taught here and we have also done what little we could in the time at our disposal to help you to be good citizens of our mother land. You are now going to enter a new and a higher phase of your life. You will certainly feel very happy on the day on which you will be declared to have passed your examination.

But how long will this happiness last? Not long. It may be for a day, for a week or for a month at the most. What? You may ask, after having worked for such a long time for this degree, is the feeling of happiness going to last only for a month? Yes, only for a month. Because happiness is a consciousness of improvement on the normal. The possession of a degree soon becomes normal and loses the charm which brings happiness. What is true of the degree is true of every possession. A new suit of clothes, a new cycle or a new work which we might turn out by our exertion will bring happiness but it cannot last for ever. The normal does not affect our feelings but any improvement on the normal induces happiness.

It is this very state of things which prompts man to work more and progress. It is this very feeling which has helped men on their onward march in political, social, or scientific progress. And it is this very feeling which will help you in your life to work more and more not only for your good, but for the good of your society and for the good of the land in which you are born.

Do not forget that the happiness thus created is only temporary and even if you betake yourself into the imaginary heaven, the

happiness will be temporary. When you first enter the heaven you will feel happy, but the heaven will soon become a normality and you will lose happiness.

Where lies then permanent happiness? It lies in a particular attitude of mind which by training we can put ourselves into. If we succeed in this training of mind, we can bring happiness on this mortal world in proportion to the success we achieve, but if we fail, we shall remain unhappy with all the possessions we wish and may be miserable even in the heaven.

How can we then make progress and yet possess permanent happiness? We must train our mind to be happy not in the result which is many times not in our power, but in the work, the honest work we turn out. Secondly, we must train our mind to be happy in pursuit of ever increasing knowledge-agricultural, chemical or social. Pursuit of knowledge is perhaps the noblest of occupations. Knowledge can be obtained by investigation, experiment and reason. Knowledge gives man the greatest power. Knowledge is a sword and a shield. Knowledge is the mother of joy and happiness. Be in pursuit of knowledge and train your mind to acquire permanent happiness. I am speaking from personal experience. I know I have not achieved the end, but I know I am on the path. With proper training of mind you will be happy in a hut, but without it you may be miserable in a mansion. I wish you happiness, a real lasting happiness and hence these words of advice.

Be you so near or be you in distant climes, the college will watch your progress all the time. Many of our students have brought credit to our college. In their different walks of life many have shed lustre on the paths, many have proved to be guiding lights. The College is proud of them all and I am sure you will also walk in their foot-steps and bring glory to the institution which is sending you out into the world.

HARD COATED SEEDS AND THEIR VITALITY.

BY

PROF. G. B. PATWARDHAN, B. SC.

Longevity tests of 20 crop seeds are being conducted in the Seed Testing Laboratory of the Economic Botanist for the last 5 years. Some of the results so far obtained are published in the annual report of the Economic Botanist to Govt. and the curious reader is referred to these reports.

The following account of the results of germination tests of seeds of two crops viz. *Phaselous radiatus.* (Marathi Udid) and *Phoselous mungo* (Marathi Mug) both being hard seeded species gives some incidental observations and tentative conclusions so far as they go.

It is generally found that, during normal laboratory tests, hard seeds specially of Leguminosae plants do not give satisfactory germination percentages. Some of them, though subjected to the same methods of treatment for germination tests as other seeds, instead of swelling and sprouting along with others remain hard and impenetrable to moisture in spite of their being kept in the testing media for the standard period of time i. e. 10 to 12 days. Under such conditions the practice is to take half the number of seeds so remaining hard as germinated and calculate germination percentages accordingly. It is presumed that the 50% of the hard seeds lagging behind are fit and are likely to germinate at some future date or that they might germinate under field conditions. On the other hand, hard seeds are either soaked in hot water, scratched or filed in order to damage their hard coats so as to facilitate intake of water by the embryo. These contrivances do hasten germination and reduce percentages of hard seeds.

Let us now see what our results indicate. The following statements may now be examined.

Table 1 Udid–Phaselous radiatus.

Sample No.	1st Test 18–30th Oct. 1925.		2nd Test 20–30th Jan. 1926.		3rd Test 18–29th March 1926		4th Test 12–17th July 1926.		5th Test 19–28th Nov. 1926.	
	Ge. p. c	Hard Seed p. c.	Ger. p.c.	Hard Seed p. c.	Ger. p c.	Hard Seed p c.	Ger. p c.	Hard Seed p. c.	Ger. p. c.	Hard Seed p. c.
1	92	9	80	10	85·5	9·5	91	0	97	0
2	93·5	3·5	93·5	1·5	93·5	3·5	98	0	96	0
3	71	22	87	4	91	5	98	0	97·5	0
4	32·5	61·5	76·5	11	88	9	98	0	92·5	0
5	35·5	55	66·5	25	80	13	92	0	94	0
6	93	0	88	0	86	1	95	0	89·5	0
Average.	69	25·1	81·9	8·	87·3	6·8	95·3	0	94·4	0

The samples of seeds were obtained from cultivators from Aundh, a village from Poona. These were harvested in the months of Sept. and Oct. 1925 and preserved in cloth bags with naphthalene balls inside.

Table II Mug. Phaselous Mungo

Sample No.	1st Test 19th 30th Oct. 1925		2nd Test 20–30th Jan. 1926		3rd Test 18–29th March 1926		4th Test 12–17th July 1926		5th Test 19–28th Nov. 1926	
	Ger. p. c.	Hard Seed p. c.	Ger. p. c.	Hard Seed p. c.	Ger p. c.	Hard Seed p. c.	Ger. p. c.	Hard Seed p. c.	Ger. p. c.	Hard Seed p. c.
1	77	18·	67·5	24·	63	29·	99	0	95	4.
2	92·5	0	93·5	1·	9	0	95	0	88·5	0
3	83·5	11·5	65	31·	68	25·5	96	0	90·5	5·
4	95·5	0	97	0	94	0	92	0	89·5	0·
5	87 5	7·5	77	24·	79·5	18·	100	0	88·5	1·
6	90	9·	82·2	13·	81	17·5	100	0	90	3·5
Average.	87·6	7·6	80·2	15·5	79·7	15	97	0	90·3	2·2

Samples of seeds were obtained from cultivators from Aundh a village from Poona. They were harvested in the months of Sept-

and Oct. 1925 and were preserved in cloth bags with naphthalene balls inside.

The two sets of samples show a consistent and continuous reduction in the percentage of hard seeds and a similar increase in germination percentages, until the one was zero and the other 98 percentage at the time of the next sowing season.

In this crop seed, one finds a certain amount of variation in that the germination percentage falls and the percentage of hard Seeds increases in the interim tests taken in the cold month of November and hotter month of March, but the final result is just the same as Udid seed viz. Total reduction of hard seeds and 100 percent of germination at the sowing season arriving next after harvest.

It appears from above that (1) the seeds do not show a large percentage of germination when sown soon after harvest (2) that they do not require a certain period of rest (3) that they germinate best after a period of rest varying from 8 to 9 months (4) that this period of rest ends when the next sowing season of the particular crop arrives (5) that the so called hardness is lost when the next sowing season arrived and that any further withholding of the seed from sowing shows reduced percentage of germination (6) the vitality of the seed is probably decreased by further keeping.

CONSTRUCTION OF WELLS IN SANDY SOILS.

BY

MR. K. B. MODI, B. Ag.,

(*Agricultural Overseer, N. Thana Palghar.*)

On soils near the sea coast which are of pure sand it has been found specially in parts of North Konkan that the supply of sweet water suitable for irrigation is usually great. It is at a depth of only about 10 ft. from the surface ; but on tapping it, further excavation for deepening the well for increasing its supply is impeded to such an extent that progress beyond a certain limit is extremely difficult to be made, if not impossible. As the progress in excavation is being made huge lumps of soil from the sides come in and fill in the cavity. In spite of the soil from the sides coming in being removed, that from further parts comes down and fills in the cavity. This

naturally results in the cavity being increased from the sides as the attempt for deepening is being made. This coming in of huge quantities of soil from sides is due to the fact that the pure sand,the particles having no cohesion, is easily loosened as soon as it comes in contact with water. This difficulty of deepening the excavation necessitates the stopping of further progress even though the supply of water below is considerable and the wells are therefore, usually, required to be constructed with the insufficient supply of water tapped. There is, at present, a large number of such pucca wells in the North Konkan, having insufficient stock of water on account of their being not sufficiently deep.

The foregoing difficulty in deepening the excavation for wells in purely sandy soils can be overcome if the excavation and the construction be done in the following manner :—

In the beginning the excavation should be made in the usual way upto the water level. On the indication of water the bottom of the excavation should be levelled and a circle of the required diameter should be marked out; outside this circle there should be another circle marked out at one and one quarter to two feet distance, depending upon the width of the construction work necessary to be done. There should, then, be blocks of plane galvanised iron sheets prepared for the constrcution of cement concrete work. These blocks should evidently be in pairs, fitting the circumferences of inner and outer circles. The length of each pair of blocks would depend upon the diameter of the circle; but roughly speaking for a well of 13 ft. diameter it is found convenient to have a pair of blocks of the length and curvature of $\frac{1}{6}$ the circumferences of the inner and outer circles. The width of the block should conveniently be about $1\frac{1}{2}$ ft.

The material to be used for the construction work should be of the following description:—

No.	Name of the material	Parts.
1	Cement (best quality)	1
2	Coarse sand ($\frac{1}{8}''$ to $\frac{1}{16}''$ diameter)	3
3	Concrete ($\frac{1}{2}''$ to $1''$ diameter).	6

It is ordinarily convenient to construct at one time half of the portion of a layer. Half of the ring between the inner and outer circles should be fitted with the inner and outer pairs of blocks and the cavity filled in with the foregoing material thoroughly mixed up before use. In about 4 hours the material dries up when the set

of blocks should be removed and used in the same way for filling concrete and cement in the other half of the ring. After the completion of the first layer second one should be constructed exactly in the same way. While the construction work has been in progress there should be long vertical iron bars ($\frac{1}{3}''$ thick) erected in pairs within itself; besides there should also be horizontal iron bars at the ends of each set of blocks. These vertical as well as horizontal bars are useful in strengthening and consolidating the construction work. On the construction work being raised to about 6 ft. it should be discontinued and kept as it is for about a week or so for being completely dried up. The excavation should then be resumed and as it is in progress the whole of the constrution work gradually sinks down on account of the underneath sand caving in. The construction work acts as a barrier for the outside sand making its way inside and impeding the progress in deepening the excavation. The best appliance for removing water in the well is the dredger; but in the absence of this it would do to have an ordinary persian wheel for the purpose. On the construction work being sunk down to the water level the excavation should be discontinued for raising it up further; after it is sufficiently raised the excavation should again be resumed. In this way the depth of the excavation can be increased to any extent so as to get full benefit of all the supply of water possible to be tapped.

The most important thing to be borne in mind in the method of deepening the excavation is that the sinking of the construction work should be extremely uniform; even a slightest unevenness in the process of this sinking means to correspondingly weaken it. The best way to achieve this is that the excavation should invariably be done near about the centre only and that it should be regular and uniform as far as possible.

In the Thana District a beginning has been made of constructing wells on the lines chalked out above. There are at present some three wells of this type and it is claimed in each case that the supply of water has increased two to three times; as a result of its having a distinct advantage there has been an increasing tendency to construct wells of this type. The only additional cost for the construction of such wells is that to be incurred on the preparation of blocks of iron sheets and it comes to about Rs. 60 for a set of the same to suit a well of 13′ diameter. In other respects it is in no way more than the chunam work.

EFFECT OF GERMISAN IN THE CONTROL OF GRAIN SMUT (*Sphacelotheca sorghi*) OF JOWAR (ANDROPOGON SORGHUM.)

BY

M. N. KAMAT, B. Ag.

Ag. Asstt. Professor of Mycology, College of Agriculture, Poona.

Germisan, a German organic compound of mercury, has been extensively tried in Germany, America and other countries in the control of seed-borne diseases. It has been used against bunt of wheat, smuts of Sorghum and the stripe disease of barley. An important consideration claimed for this fungicide is its ability to invigorate seed germination apart from its ability to control the disease.

The writer, therefore, undertook an investigation into the effectiveness of Germisan as a fungicide in the control of the Grain Smut of Jowar and its ability to stimulate seed germination. The possibility of replacing the copper sulphate steeping method in vogue at present in this Presidency, by the Germisan treatment was also gone into.

Good selected seed of Shaloo (Rabi) Jowar was mixed thoroughly with live spores of *Sphacelotheca sorghi* and then divided into three lots and each of which was treated in the following manner :—

Lot. I.—Steeped in Germisan mixture (4 oz. in 100 gallons of water) for half an hour and dried.

Lot. II.—Steeped in Copper sulphate mixture (one pound in 50 pounds of water) for 15 minutes and dried.

Lot. III.—Untreated (Control).

All these three lots of seed were then separately sown in four rows each on November 6, 1923 and harvested on March 22, 1924

The heads were then examined and sorted out for each lot separately and the following table shows the results.

Lot No.	Treatment.	Total No. of heads.	Total No. of infected heads.	Percentage of infection	Percentage of germination.
1.	Germisan	210	...	....	95
2.	Copper sulphate	205	...	...	86
3.	Control	110	96	87·2	92

It will be noted from this table that Germisan has controlled the disease as effectively as copper sulphate. However, the difference between the percentage of germination in the Germisan-treated seed and that of the seed treated with copper sulphate, is not significant enough to be of practical value. Germisan, therefore, does not seem to possess any advantage to justify its substitution for the copper sulphate method of treatment, while, on the other hand, it costs more and being a proprietary compound, is not easily available in India.

AGRICULTURAL STATISTICS.

by

H. M. DESAI. B. Ag.

and

K. R. PATEL. B. Ag.

In the previous article the land holders or holdings were given for the years 1916-17 and 1921-22.

The following statement shows the Percentage of area under different classes of holdings and the percentages of the class of holders.

% of Land-Holdings and of Land Holders.

Districts	Totalarea in acres	% of area under each Class of holding						Total no of holders	% of Land-Holders holding area under each Class of holdings					
		up to 5 acres	5 to 15 acres	15 to 25 acres	25 to 100 acres	100 to 500 acres	above 500 acres		up to 5 acres	5 to 15 acres	15 to 25 acres	25 to 100 acres	105 to 500 acres	above 500 acres
Ahmedabad.	721,647	14	27	15	23	11	7	65,716	54	28	9	7	1	...
Kaira	754,196	32	30	12	13	5	8	146,430	75	20	3	1	...	...
Panch mahals.	320,761	13	40	19	19	6	3	35,776	44	42	9	5	...	...
Broach	627,688	9	25	14	33	11	7	49,759	49	28	10	11	1	...
Surat	731.093	18	27	15	27	11	3	97,250	63	24	6	5	1	...
E. Khandesh.	1,907,823	6	20	20	35	15	4	116,137	31	35	17	14	2	...
W. Khandesh	1,458,509	2	13	17	46	16	6	57,591	14	33	22	28	2	...
Nasik	2,206,043	4	16	19	45	13	3	117.023	26	37	17	18	1	...
Poona	2,166,104	9	20	20	36	14	1	167,802	47	26	13	12	1	...
Satara	1,768,018	18	28	18	28	7	1	222,138	61	24	8	6	1	...
Sholapur.	2,308,337	2	13	18	49	15	3	97,200	19	30	21	26	3	...
Thana	915,611	11	14	12	27	24	12	87,123	67	18	6	7	1	...

Kolaba	429,493	17	19	12	25	20	7	56,781	71	17	5	5	1	...
Ratnagiri	593,314	15	17	15	38	10	3	80,245	69	19	6	5	1	...
Kanara	346,463	12	22	13	28	19	6	42,780	68	20	5	5	1	...
Belgaum	1,622,213	13	24	16	30	11	6	138,682	47	32	10	9	1	...
Bijapur	2,839,940	3	14	19	42	16	6	124,565	21	32	21	22	3	...
Dharwar	2,205,848	8	22	20	35	12	3	143,082	37	37	15	11	1	...
N. W. Frontier	895,043	0	1	2	10	25	61	5,365	15	17	20	27	15	5
Sukkar	796,795	9	18	9	25	23	16	49,886	50	30	8	8	2	...
Larkhana.	1,297,006	6	12	13	27	27	15	62,245	39	31	14	13	3	...
Nawabshah	1,289,052	3	6	5	26	32	28	29,967	33	27	12	19	7	1
Hydrabad	1,390,269	1	5	6	21	28	39	23,086	16	29	18	25	9	2
Tharparkar	1,244,356	0	2	2	15	30	50	10,844	12	19	12	36	15	5
Karachi	790,899	3	7	6	20	21	43	14,981	24	27	19	22	7	1
Bombay Presidency	34,525,545	7	17	15	33	17	11	21,79,045	46	28	12	12	2	...

The above statement clearly shows the pressure of population on land in the Presidency proper and especially in Gujarat and Konkan.

MY TRIP TO THE ANDAMANS

BY

G. B. DESHMUKH.

(The general conditions governing life, Agriculture etc.)

Even the simple mention of Andamans or the "Kala pani" fills both the speaker and his companion with terror, then what of going to the place itself to get the first hand information about the conditions prevailing therein! It needs no mention as to what class of people inhabits the place, but it wont be far from truth if I say that very few have got the knowledge of the conditions of life prevalent there, the exact nature of the people, the agriculture, the cottage industry etc. of that place. Hence I intend to write a few lines by way of information from personal experience, which I hope will be interesting.

Since 1921, these islands ceased to be the place of exile and the Govt. have decided to make use of these islands as a small colony, by developing their agricultural, mineral and forest resources and thus make the people self-supporting. So the Govt's attempts are directed towards that goal. Since the foundation of the penal settlement the authorities who directed the state affairs were either recruited from the military or the police force and Medical corps; while occasionally a Dy. collector and some of the U. P. or the Punjab tahashildars went over to Andamans in the Revenue dept. But there was no one who could tackle the problems relating to the soil and the plant life.

However, to correct this defect the Andamanese Govt. sent up a request for an agricultural officer, to the Govt. of India who advertised the post. I applied for the post and was selected as the Agricultural officer for the Andamans and the Nicobar islands In May 1926, I left Poona via Calcutta to catch the Mail to Port Blair, but missed it and therefore, had to run to Rangoon from where the Steamships sail for Andamans. The S. S. "Maharaja" a chartered ship of the Asiatic Steam Navigation company weighed her anchor off Rangoon on 17th May 1926 at about 2 p. m. and after two days i. e. on 19th May we landed at Port Blair.

The group of these islands lies in the centre of the Bay of Bengal about 800 miles off Calcutta and Madras and about 350 miles

off Rangoon. The sea there is calm from about January to April and for some days in October and December; otherwise it is very rough and the intensity of this condition of the sea is aggravated if the steamships are of light weight-types.

About 40–50 miles off from the Andamans towards the east we sighted a small island, without any living soul on it. This is the famous valcano, Narkundam, now quiescent. There are, it is said, many hot springs in the vicinity.

As said above, we landed at Port Blair in the Morning of 19th May and I was specially delighted to see the coast as I was much bored by sea-sickness during the whole of the voyage..

On the right side peeped through the cocoanut trees a sombre-looking, fortified. castle-like building and it was needless to say what it was. It was the Famous Cellular Jail of the Andamans. On the left hand side fluttered the August-looking flag with the Union Jack showing that His Honour the Chief Commissioner was on the Settlement. On landing I was, however particularly struck with the red painted Government buildings, the roofs of the residences, and free convicts clothed in striped shirts and dhoti.

As I had to see His Honour the Chief Commissioner on the Ross, I instructed the Jailor, who was asked to receive me, and to take me to that place. I was lodged on Ross in the Circuit house where it is customary for the visitors to put up. On enquiries being made as to the where-abouts of the C. C., I was informed that His Honour the C. C. was out on the Mount Harriet to inspect that place and would be back by about 11. I saw His Honour the C. C. at about 12 Noon when he first made formal inquiries and then drew a plan of work for me to be followed in the settlement.

The island of Ross is about 1 sq. mile in area. On it we find the residences of high govt. officials, General hospital, General post office for the settlement, a church, a Mess store, Andamanese club and other social clubs for the Indians and the anglo-Indians. In short, the State has provided the officials as many facilities and means of recreation as it is in their power to do.

Andamans are a small group of islands lying in the midst of the Bay of Bengal. The famous jail is on the South Andamans; and on this tapu...Aberdeen...as it is called reside the Dy. Commissioner, the Revenue Commissioner, the Comdt. Military police and other high and sub-ordinate officers. This is also the Bazzar place for the whole of the settlement. The Port officer and the Harbour master, a

recruit from the Indian Royal marine, resides on the Pheonix bay and has his establishment and workshop there.

The present penal settlement measuring about 200 sq miles is on the South Andamans, and the State has experienced much difficulty and trouble to bring it to the present stage of development. It is the work done by lakhs of convicts. The general lay of the settlement presents an appearance of alternate hills and valleys.

Climate:—The islands being in the bay of Bengal, receive a great amount of precipitation for about 7 to 8 months. The islands are often frequented with squalls of terrible fury, and none but the cocoanut can resist them. From the agricultural point of view, the principal crops to mention are Paddy and Cocoanut. Paddy season is from July–Dec. The cheena dhan, hati dhan, Khusabut all coarser varieties are grown by the people. We do not find the finer and superior types of the Indian peninsula I, however, introduced Kolamba, Ratanghos and Ambemohar, and they were seen to grow well. Beside these, we find maize, many vegetables and fruit trees. Tea and coffee plantations are also raised in the Gobang and Kalatang valleys and the latter towards Garacharma side.

The soil is very fertile and is in abundance for cultivation. Sugarcane is grown on hills and develops a thicker cane than our Pundya type. The only defect is that it is severely affected with red-rot.

The islands are thickly covered with forests and the forest department is exploiting the same with zeal and vigour. We come across many new and uncommon species of trees. Padouk is the principal and important wood of commerce. Albizzia lebbek is commonly met with and we see it growing along the creeks and the salt water swamps. The forest department is the branch of the Indian forest department, under the direct supervision of the Chief Forest Officer.

The forest dept. owns two sawing mills, one at Chathan and the other at Bonington, North Andamans. The work and the output is very profitably disposed of to the customers, either in Rangoon or in Calcutta.

Geology of the island:—It is not definitely known when these, islands had emerged out from the deep fathom of the sea. Whatever may be the date, we can well agree with the observation made by the previous writers, that these islands have come out of still and slow moving water at the mouth of the big rivers flowing into the Bay of Bengal, like the Ganges, the Krishna, and the Godavari

The silty nature of the soil and the hills confirm our statement. Again, that the island must have been of very recent date is seen from the fact that the rocks are very fresh and brittle, having yet to form different types of hard rocks. In few places we find, metamorphic rocks, most probably due to the hot lava flowing from the neighbouring Volcanoes-Narcundam and the Saddlepeak.

Wild and domesticated animals :—Of the wild animals we meet only the small type of pig. He is not so furious as our Indian wild pig nor so monstrous in size and shape. Reptiles and Boa Constrictors are there as it is said. Snakes inhabit the place. One most unsightly and ferocious animal is the centipede. This centipede or the 'Kankhajura" as it is called is very poisonous.

Of the domestic animals we see the buffalo, cow, sheep, goat and the horse. The first one does well here and may be made to form the basis of the dairy industry of this place. Sheep and goats also do well, but to a less degree. Cow and the horse do not seem to fare well in this climate. They are often affected with pulmonary diseases. The plenty of green fodder and extensive pastures in close vicinity of the villages facilitate the keeping of animals. In comparison to the density of the population and the area we may boldly say that the settlement has been well provided with the domesticated animals. It is highly probable that dairying will be pursued with profits in certain parts of the settlement.

Population.—The present Chief Commissioner has so arranged the occupation of the settlement that the free people and the convicts have separate parts for settlement. The side next to Ross is colonised by the free people and the other side by the convicts or the free people if they like. The villages are ingeniously populated by self-supporters and every provision as the Patel, a Chowkydar, school, and a Gram Panchayat for the sanitation of the village is made. Recently owing to the progressive policy adopted by His Honour the Present Chief Commissioner, the local boards have formed an association to represent their views and to make their voice heard in the Government of the Islands.

Such is the present condition of the place, and in near future it will be developed into a small colony as a result of the development of agriculture and the exploitation of the soil and the forests,

REVIEW OF AGRICULTURAL OPERATIONS IN INDIA—1925-26.

The Agricultural adviser to the Government of India, Pusa every year publishes a report which gives in a nutshell the present state of Agriculture in different provinces of India reviewing its progress in every branch of its activity. The following few lines are written with the intention of describing the salient facts from the Report for the benefit of the readers of this magazine.

For the sake of convenience the report is divided into different chapters. In the First chapter the general agricultural conditions prevalent through out the year are described and it is remarked that the season, though characterised by even distribution of Rainfall, taking India as a whole be described as fair, almost all the important crops giving moderately good outturns. The general condition of the agricultural population, depending as it does primarily on the course of the monsoon was fairly good.

The Second chapter deals with the Economic work done on crops. The work under this mainly consisted in the separation of the mixtures into their component parts and testing the economic value of the types found Accordingly several high yielding strains suitable for different soils and climatic conditions have been evolved. Where suitable types however have not been found by Pure-line selection, by bridization has been resorted to. Thus there are entirely now strains of wheat, cotton and sugarcane under cultivation.

Good progress is made in introducing the new varieties and an increase of 100 percent and over in the net profits has taken place in some cases where either an improved variety of the same crop or quite a new crop has been introduced.

Under Research and Investigation is detailed the considerable amount of Research work bearing on the fundamental Problems of Agricultural Chemistry, Agricultural Bactiriology, and Plant Pathology that is being done by various Departments of Agriculture in India.

Under soils, experiments in connection with conservation of moisture are important. While dealing with manures and fertilizers, it is remarked "that the best use is not at present made of cattle manure. Much of the oil seed grown in India and a considerable part of such oil-cake as is manufactured, finds its way to other countries. Euro-

pean countries have imposed an import duty on oil while allowing free entry to oil seeds and cakes. The Taxation–Enquiry Committee have in their report therefore rightly recommended that "as regards oil seeds and manures, an export duty should be levied and a part of the export duty should be applied towards educating the cultivator to make an increased use of artificial manures."

Regarding Organic manures, attempts are being made in various provinces to manufacture them from different substances. The possibility of producing artificial farm yard manure from straw and waste–products such as Groundnut husk and prickly pear is under investigation. At Dacca seventy three tons of artificial farm yard manure was prepared from organic refuse like sugarcane pith sugarcane leaves, weeds, waste straw by using cattle urine as the Starter. While investigating the influence of manures on quality of crops–the relationship between the manurial constituents of the cotton plant and the quality of cotton lint produced is being studied at coimbatore. It appears that the plant absorbs from the soil a very large amount of lime especially at the time when the bolls are forming. Under the heading Lantana it is stated that a large measure of success in Bombay in eradicating Lantana can be attained by cutting the Bush and the stump painted with sodium arsenate, This method has given 94 percent of successes. The chemical analysis shows that the Arsenic penetrates the plant and reaches the smaller root branches.

Chapter Fourth deals with work done in connection with Agriculural Engineering. The work is divided under two heads—(1) wellboring and (2) The designing and testing of agricultural Implements. The work in well-boring is being carried on but on a comparatively small scale. The work under the second head is just begun. In the fifth chapter is described all the Propaganda work or Extension work under the heading "District work". The organisation under this sphere embraces the activities of thousands of Private seed farms, demonstration plots, cooperative societies, Agricultural associations etc.

In Chapter sixth the state of Agricultural Education is described. At present for imparting Agricultural Education three types of Educational institutions are in existence each with a distinct aim, and these are (1) Full degree or diploma course college, (2) Agricultural schools, and (3) short courses; all of these are working very satisfactorily.

In the-chapter on Co-operative movement as affecting Agriculture it is said that the propaganda work of the Agriculture Depart-

ment could with advantage be carried out on a much larger scale through organised bodies of cooperators. In recent years the relation between the Agricultural and Cooperative Departments have become increasingly close, still until the two functions of the money-lender and the trader are taken over by the cooperative movement, agricultural depression will not be materially relieved. To accelerate the progress the organisation of Non-credit farm of Agricultural Cooperation should be a definite branch of cooperative work. In the last chapter on Live stock is given all the work done regarding Live stock. It consists of the (1) work of the (1) Veterinary Department regarding the prevention and treatment of disease and also Veterinary Education (2) the work on animal Breading. The last is divided into three heads–Cattle-Breeding, Sheep-Breeding and Poultry-Breeding.

At the end are given tables of giving different statistics—the export and import statistics of which are really the most important from the point of view of statistical information.

V. G. D.

FLOWERS OF CASUARINA EQUISETIFOLIA.

BY

S. S. BHAT, B. Ag.

The casuarin a tree is perhaps very common, though not indigenous, in the Bombay Presidency especially in the coastal tracts. This tree is so easily recognisable at first sight that hardly any attention is necessitated to its floral parts in the process of its identification. The flowers of this species however, present an interesting case for the consideration of Botanists.

"The flowers are unisexual: staminate in cylindrical terminal spikes, each flower consisting of a stamen inclosed in 4 scales, 2 of the scales being attached to the filament; pistillate flowers in dense heads borne in the axils and ripening into globular or oblong cones, composed of one-ovuled ovaries subtended by bracts; fruit a winged nutlet"

In the Ganeshkind Botanical Gardens, Kirkee, are to be found two distinct types of casuarina trees, considered from the point of view of their inflorescences. A short description of these trees will be as follows:—

(a) This tree has hard drooping branches. It bears only pistillate flowers, and is laden with fruits almost throughout the year. The fruits are globular and dark green.	(b) The branches of this tree are characteristically erect. This tree bears only staminate inflorescences.	The large number of the other casuarina trees stand somewhat midway between I (a) and I (b) in so far as their branching habit is concerned. These trees bear both male and female flowers on the same branch and are hence monoeceous beyond a doubt. The fruits are brighter green in colour and larger in size than those of I (a).
	STEM	
Dirty reddish brown; smoother and less scaly than 2; nodes on the branches 7 to the inch; nodes on the branchles 3 to the inch; scales in each whorli whorl on branches 12, and on branchlets 11; whorl of scales on branchlets has a reddish brown ring.	Exactly similar to that of I (a).	Ashy brown in colour; rough and highly scaly: nodes on the branches 13 to the inch; nodes on the branchlets 3–4 to the inch; scales in each whorl on branches 7: and on branchlets 6; whorl of scales on branchlets plane and whitish.
	FLOWERS.	
Flowers and fruits more freely than 2. Ovaries single-celled; multiples of 9,10, or 11 arranged in cross section in each flower.	Almost every branchlet has a staminate spike, which is over $1\frac{1}{2}$ inches in length.	Many branchlets have no staminate spikes. Staminate spikes three-tenths to half-an-inch in length. Ovaries single-celled; multiples of 7 arranged in cross section.
	FRUITS.	
Number of achenes in cross section is 9, 10, or 11.	Absent.	Number of achenes in cross section is regularly 7 in all cases examined.

These types of casuarinas were suspected to belong to different species. Specimens of all these were therefore sent for identification to the Royal Botanic Gardens, Sibpore, Calcutta. A reply received discloses that they are all Casuarina equisitifolia Linn.

Now then arises a question as to whether C. equisitifolia is a dioeceous or a monoaceous species. The first two trees described above support the view that this species is dioeceous, whereas the last mentioned kind of trees repudiates it. In this connection to quote Haine's note on the genus and the species from his Flora of Behar and Orissa, Vol. V. page 840, will be appropriate.

" Hooker, under C. equisitifolia in his flora British India, says " dioecious? ... " Prain in his Bengal Plants, probaly following Roxburgh, says "dioecious" (without a querry) but the trees growing in the Calcutta Gardens are certainly monoecious, and I have never seen them otherwise."

Cooke in his flora of the Bombay Presidency, remarks, "It is a tall ever-green leafless very ornamental dioecious tree, with cylindric or angled deciduous branchlets."

Talbot agrees with Cooke and definitely puts down that the "flowers are dioecious."

While thus opinions on this point vary widely, the descriptions of the trees above seem to lead to the conclusion, if any could be hazarded at this stage of enquiry, that the species in question *has both monoecious and dioecious trees.*

The differentiating points of the two types may be summed up as follows:—

1. The morphological descriptions of the two trees described under I are exactly similar. They differ in that the one bears only staminate spikes and naturally no fruits, while the other bears only pistillate flowers and fruits profusely. These are therefore male and female trees of the same type, and present a strong evidence of dioecious nature.

Morphologically, trees described under 2, are widely different from those described under I. The number of nodes is nearly double while the number of scales is nearly half. The absence of the reddish ring on the whorl of scales on the branchlets is characteristic.

2. The staminate spikes of I (b) are two or three times longer than those of 2. I (b) again bears a spike on almost every, branchlet,

whereas nearly half the number of branchlets in 2 are barren. This means that the former produces 4–6 times more pollen grains than the latter.

Next, the pistillate flowers are more common and larger in number in I (a) than in 2. Not only that, but the number of ovaries and stigmas in each pistillate head is nearly one and a half times more in I (a) than in 2. This may be construed to mean that I (a) affords a wider range of possibilities of catching the pollen grain than 2.

Both these characters indicate a possible adaptability of a dioecious nature of trees, in which the chances of pollination are certainly fewer than in monoecious trees.

DEPARTMENT OF AGRICULTURE, BOMBAY PRESIDENCY.

Ahmedabad Agricultural Show, 1927.

LEAFLET No. 1

In the General Meeting held on 6th January 1927 at Ahmedabad under the Chairmanship of Mr. G. E. Chatfield, Commissioner, N. D., it has been decided to hold the annual grand Agricultural show of the Bombay Presidency at Ahmedabad from 1st to 12th, December 1927, under the Presidentship of His Excellency the Governor of Bombay. An Executive Committee of 20 members has been appointed; many patrons have been enlisted from amongst the Ruling Chiefs, Sardars and other Gentry of Kathiawar and Gujarat, and more are being enlisted. It is hoped that sufficient funds will be raised through the willing co-operation of all classes of the public.

2. Since the greatest Indian Agricultural Show was held at Poona in October 1926 it has been generally acknowledged, how advantageous, or rather essential it is to hold such shows anually at different places. Amongst the many opinions which may be entertained about the future welfare of India, there is one upon which all must agree–viz., that the future of India is bound up with the prosperity of the agricultural population. This prosperity depends upon four things, viz, (1) Introduction of technical agricultural improvements; (2) Development of secondary occupations; (3) Organisation to prevent wastage and (4) Improvement in public health. In other words we must teach the people (1) how to grow crops 25 % to 50 % better than at present; (2) how the

spare time of agriculturists can be best utilized; (3) how to sell the produce for its actual worth; and (4) how to bring up the children of the rural public strong and robust. A big Agricultural Show is one method of impressing lessons on these points upon the minds of the rural population. It teaches by actual examples what should be done and how.

3. To this end, officials and non-officials, Agricultural Associations, Development Associations and other bodies as well as private gentlemen interested in the advancement of agriculture are invited to render their services in making the proposed Show at Ahmedabad as great a success as the Show at Poona. Even much great efforts are required at Ahmedabad as it is lacking in many advantages which Poona enjoyed such as a ready made ground, buildings, expert advice, help and supervision of the staff of the Poona Agricultural College and of Military, P. W. and other Departments. It is therefore earnestly requested that every one will come forward and give what help he can in making the preparations for the Show.

4. All the agricultural officers in the presidency proper are requested to arrange from now onwards for collections of samples of Field produce on the same lines as was done at Poona. It will not be possible to get samples of Jowar, Cotton, Rabi and other crops of the next season as the Show will be held in December 1927. It is therefore necessary that these should be collected from this season's harvest and necessary arrangements for the same may be commenced at once.

5. The general arrangements of the Show will be in the hands of the aforesaid Executive Committee, with the Commissioner, N. D, as its Chairman, and the General Secretary of the Show will be the Deputy Director of Agriculture, Gujarat, Surat. The Show will be divided into separate sections and sub-sections and Sectional Committees with their Secretaries will be appointed later on. Arrangements for catering will be on an extensive scale and the Railway Companies will be moved to grant special concessions to visitors & exhibitors. Prize money will be available on a liberal scale and there will be valuable prizes or medals for machinery, implements and other exhibits. The Show ground will be near Shahi Bagh. Further arrangements will be notified in the next leaflet.

SURAT,
28th January 1927.

CORRELATION BETWEEN YIELD AND SOME PROMINENT CHARACTERS IN ANDROPOGON SORGHUM.

BY

G. L. KOTTUR, M. Ag.

AND

V. M. CHAVAN, B. Ag.

Andropogon Sorghum (Jowar) is extensively cultivated in many parts of the country. Bombay has a large area under it in all districts with the exception of Konkan–a narrow strip of land along the western coast. Its Southern districts of Belgaum, Bijapur and Dharwar are more important in this respect as jowar forms almost entirely their food and fodder crop.

Dharwar is noted for growing a large number of Kharif varieties. These grow well on both red and black soils and yield better than most of the Rabi jowars. The yield of fodder in this district is generally much more than what is actually required and it is for this reason a centre of relief in famine years. Andropogon Sorghum is thus an important crop in Dharwar District and the selection of high yielding strains in some of the Kharif varieties is in progress on the Government Farm at Dharwar.

While doing the selection for improving the yielding capacity the probability of some characters being associated with high yield was noticed and a careful study of the correlation was done in the more important varieties growing at Dharwar. The correlation between yield and the following characters were studied:—

(1) Height of the plant.
(2) Number of leaves on the plant.
(3) Length of the peduncle.
(4) Length of the rachis.
(5) Breadth of the ripe ear.
(6) Weight of the ripe ear.
(7) Size of the grain.

The correlations were studied in four varieties and each representing a group. A short description of the varieties is given below.

Fulgar :—Tall variety with a compact ear. Rachis short, peduncle short and straight. Grain big.

Bilchigan :—Tall growing variety. Ear loose and thick. Rachis long, peduncle short and straight, grain small in size.

Nandyal :—Tall and thin stemmed variety. Ear long, thin and loose. Rachis long, peduncle short and straight, grain small.

Chawri :—Dwarf variety. Ear long very loose. Rachis long branched, pendunele long straight, grain small.

(1) Correlation between yield of grain and height of the plant.

The correlations were studied in a variety that was pure, that is to say, free from the mixture of other types which are common in many cultivated varieties of the Karnatic. The number of individuals taken in each case was 200. The height of the plant was measured from the first node to the base of the peduncle in centimeters and the grain of each plant weighed in grams. The following correlations were obtained :—

Name of variety	(Coefficient of correlation).
Fulgar	0·678±0·024
Bilchigan	0·617±0·027
Nandyal	0.478±0·034
Chawari	0.663±0.025

The correlation between the height of the plant and yield of grain is in the case of all the four varieties studied, positive and reliable except in the case of Nandyal a tall and thin stemmed variety with long ear. This shows that the cultivators' method of judging the yield from the height of their crop is correct.

(2) Correlation between the number of leaves on the plant and the yield of grain :—

The height of a plant may increase by the increase in the length of the inter-nodes or the number of the nodes. In the latter case there would be more number of leaves on a taller plant. To find out therefore the relation of leaves with yield the correlation was studied with the following results :—

Name of variety.	
Fulgar	0.619±0.031
Bilchigan	0.552±0.029
Nandyal	0.563±0.038
Chawari	0.520±0.032

The correlation is positive and reliable in all four cases.

(3) Length of the peduncle and yield of grain.

The length of the peduncle varies in different varieties and there is a belief that long peduncle does not mean a good yielding type. The high yielding varieties of Karnatic all belong to the short peduncle type. Of the four varieties studied only one belongs to the long peduncle class.

Name of variety.	
Fulgar	0·227±0.042
Bilchigan	0.217±0.042
Nandyal	0.190±0.043
Chawari	0.22[illegible]±0.042

The correlation is negative in the short peduncle class and positive in the long peduncle. In all the four cases the correlation is small and not marked.

(4) Correlation between the length of the rachis and yield of grain.

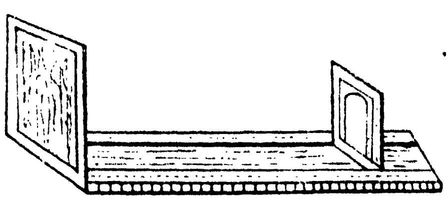
This is an important thing for a plant breeder engaged in the improvement of the jowar crop because the length of the rachis can be accuratively measured on the plant much earlier than any other character of the ear. This affords facility for selfing the selected individuals. The following table gives the correlation.

Name of variety.	
Fulgar	0.877±0.011
Bilchigan	0.641±0.028
Nandyal	0.828±0.015
Chawari	0.822±0.015

The correlation is in all cases positive and high.

(5) Correlation between the breadth of the ear and yield of grain.

The breadth of the ear is constant when the ear is ripe and dry. In the case of compact varieties it can be easily measured but when the varieties are loose no two measurements taken are constant as pressure applied while measuring varies. We have however advised a simple instrument which enables us to measure even a loose variety actually. It is shown in the accompanying diagram.



The ear is placed touching the board on the left and the right side board which slides in the grooves is then moved to touch

the ear. The lower board has a scale which shows the breadth of the cross at the broadest point. In this way we measure the breadth and the measurements obtained are reliable to a great extent.

The correlation between the breadth of the ear and yield is given below :—

Name of variety.	
Fulgar	0.906±0.008
Bilchigan	0.816±0.015
Nandyal	0,837±0.014

The correlation was not studied in Chawri because in that variety the branches being few the breadth of the ear is not more than the thickness of the rachis. The correlation in the case of all the three varieties studied is positive and very high.

(6) Correlation between the ear-weight and yield of grain.

For this purpose the ear is separated from the peduncle just below the first branch and weighed. This is another important character which can be easily measured. One can after some experience detect small differences in weight by feeling the ears on the palm of his hand. Of all the characters therefore the ear-weight is of special interest to the cultivators who wish to practise selection in their crop. The correlation found here is given.

Name of variety.	
Fulgar	0.973±0.002
Bilichigan	0.978±0.020
Nandyal	0.965±0.003
Chawari	0.979±0.002

In all cases the correlation is positive and very high.

(7) Correlation between the size of the grain and yield of grain.

The size is judged from the weight of 100 grains taken from the ear. Small grains weigh less than the big ones. The correlation obtained is given below :—

Name of variety.	
Fulgar	0.143±0.046
Bilchigan	0.248±0.045
Nandyal	0.288±0.044
Chawari	0.289±0.0141

The correlation is positive but too small to rely upon.

Five out of seven characters studied show decided correlation and we propose to continue the work with other varieties. We are in our selection work almost entirely guided by the length of the

rachis not because it gives the highest coefficients of correlation but because it is easy to measure on the plant even before flowering so that the selected material if necessary can be selfed. This has given us a good deal of satisfaction.

Summary.

Correlations between the yield of grain and seven characters of the stalks and ear are studied in Andropogon Sorghum (Jowar)—four important varieties of Dharwar (South Bombay) being selected for the purpose. The correlations are positive and reliable in five and small and un-reliable in 2 cases. The length of the rachis and the breadth of ear have high degree of correlation. The length of the rachis is easy to measure on the plant before flowering and this is mainly employed by the writers in their selection work. It has supplied a satisfactory basis so far.

A SIMPLE DEVICE TO ENSURE SATISFACTORY GERMINATION IN EXPERIMENTAL WHEAT PLOTS.

BY

B. NAZARETH B. Ag.

(*Superintendent, Wheat Breeding Station, Kirkee.*)

In many wheat plots defective germination of seed or loss of seedlings by drying after germination, is often met with. This defective germination or uneven stand may be due to irregular or insufficient moisture in the soil, to failure in depositing the seed at a proper depth while sowing and sometimes to dropping the seed irregularly while sowing with the seed-drill. Some of the drying may also be due to Fusarium Wilt or to white ant trouble.

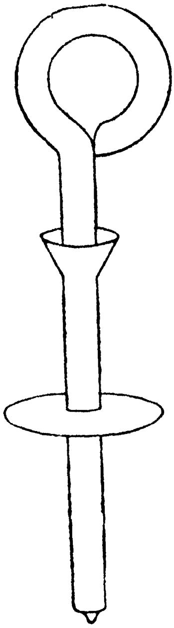
These difficulties, howeve, are partly overcome by the cultivators, by resorting to a larger seed rate and by sowing with a drill

at the hands of a well-versed man. So that, if the moisture conditions are good and there is no Fusarium or white ant trouble, they can get a fairly good stand without many gaps. Thus the method works well, when the sowing has to be done on a field scale. But in an experimental plot, like the wheat Breeding Station at Ganeshkhind Botanical Garden, Kirkee, where it is necessary to record plant to plant measurements and to give uniform spacing and equal treatment to each and every plant as far as possible, sowing with a drill is out of the question and failure of the seed to germinate is apt to result in gaps and uneven conditions. Resowing at a later period, means inequality again and does not serve the purpose well. Filling the gaps by transplanting has also the same consequences and is not convenient. So dibbling single seeds only with the hand at equal distances and at proper depth has to be resorted to.

This method, however, is very slow and more or less laborious if several cultures are to be dibbled in this way. In order to save time and labour at the wheat plots at G. B. G. the practice so long has been to open furrows of sufficient depth with a pickaxe and to drop single seeds in each of them at equal distances through holes made by strips of wood of convenient length ; and then to close the furrows and press the soil with a beam drawn over it.

With the experience of a year or two, it was thought that this method was faulty. It was suspected that the furrows so opened must be unevenly deep at different points and being exposed for sometime before being closed up again they must be losing some of their moisture. So that uneven conditions or gaps could not be avoided. Ways and means of securing better conditions and better germination had therefore to be found out and eventually Mr. R. K. Bhide, crop Botanist to Government of Bombay, Poona worked out a simple device which now gives promise to attain the desired end.

This device or dibbler is a simple cylindrical or slightly slanting tube about an inch and a half long with ½" diameter at the lower end and slightly broader at the top with a funnel like recepticle through which the seed is deposited. A circular plate 4 inches from the lower end runs round the tube to serve as an indicator for the depth required. An iron rod, fitting inside the tube and having a grip at the tip is put in, and the tube with the rod in it is pressed in the ground. This makes a hole in the soil of the required depth. Removing the rod a seed is dropped in the tube and inserting the rod again, the tube is taken out.



In this manner the whole plot is dibbled at every four inches in each line and the holes are covered up with the soil. There is thus no necessity to open a furrow and owing to the tube there is no likelihood of the hole getting clogged before depositing the seed. Thus much labour and considerable moisture is likely to be saved.

From tests made with this dibbler in different conditions of soil, 84 to 96% germination has been obtained. And so it can be definitely said to be an improvement in every respect over the former method.

Four sets of tests were made in four different soil conditions and 200 seeds were sown in two lines and the germinated seedlings counted. The following table gives the figures of germination on different days and the total germination percentage.

Tables showing the germination percentage.

Soil conditions.	Tests.	No. of seeds sown.	Germination after.			Total germination	Germination percentage
			6 days	7 days	8 days		
Wholly dry	1st	200	144	18	6	168	84%
Partly dry	2nd	,,	113	57	10	180	90%
Slightly wet	3rd	,,	88	69	11	168	84%
Moist soil	4th	,,	145	35	12	192	96%

The above tests, however, were not made at the proper sowing time when the soil was in a better condition. Consequently if this dibbler is used at the proper sowing time, it is expected to give even a higher percentage of germination. Along with these no check tests with the usual method of sowing were made, but from the experience and records of past years it can definitely be said that 60 to 70 percent germination has even been obtained.

A similar dibbler with slight modifications may be used for sowing the replications, where more seed has to be sown so as to simulate field conditions without sowing an unequal quantity of seed.

STUDIES IN THE CHEMISTRY OF THE SUGARS IN THE FRUITS ESPECIALLY MANGO DURING THE PROCESS OF RIPENING.

BY

V. G. PATWARDHAN, M. Sc., M. Ag.

The mango is the choicest fruit of Hindustan. It is the pride of the garden and is the most attractive and delicious article of the table. Other fruits we are content to eat when ripe but the mango is good in all its stages of growth. This importance of the fruit made me study it in one of its phases.

The following are the points that are dealt with in this paper.

1. The study of the details of the process of harvesting and of the artificial ripening as carried out locally, in Poona and the Deccan.

2. Finding the controlling conditions such as temperature, aeration &c.

3. Changes in the amount of moisture, relation of pulp, skin and stone to fruit and difference in taste, smell, and colour.

4. Changes in the amount of acidity during ripening.

5. Changes in the amount of sugars both reducing and non-reducing, during ripening.

1. The harvesting of the mango fruit is a very important matter. To determine the right stage of harvesting is a matter of great experience. The professional buyers of mango plantations are quite versed in the operation of harvesting. They do this business on cooperative system generally as partners. As a rule when some fruits (wind-falls) about half a dozen are discovered as semi-ripe and when the fruits are full sized the picking from the tree may commence. When mangoes begin to fall naturally from the tree which are known as "*Pad*" fruits the picking up of mangoes for artificial ripening can be safely done. The "*Pad*" fruits are generally softened fruits with slight change in the colour of the skin and are slightly sweet to taste. After such semi-ripe fruits are found, if the mangoes are kept till ripe on the tree they are spoiled by birds,

such as crows, parrots &c. and are not useful for artificial ripening In some varieties changes in the colour of the skin from green to whitish or to yellowish or to bright red (Shendrya) on the exposed shoulder of the fruit, forms a guide to know the right stage of picking. For making pickles and preserves the fruit is generally. picked when it is fully developed on the tree, but usually some days before it is ready to be picked for ripening.

G. M. Woodrow (Page 22 says "when the fruit is ripe, the gush of sap that comes out from the hilum of the fruit, quickly dries up and becomes a drop of gum. Fruit gathered in proper conditions ripens without shrivelling and the mango sweetened and ready for table as a charming object with a glowing colour, of smooth surface, and most attractive odour. When gathered too early the sap exudes freely, does not agglutinate and the fruit shrivels."

In the case of *Pairi* and *Alphonso* varieties fruits are picked with stalks attached as it is believed that the fruits picked, in this way last longer. There is no evidence to show that picking the fruits with stalks or no stalk has any relation to the lasting quality of the fruit, as stalks wither and fall off in two or three days; but presence of stalk prevents cozing out of the sap all over the skin and thereby prevents spoiling the beauty of the highly prized fruits.

The fruits are severed from the tree by means of two iron blades fixed at the end of a long pole with a bag-net attached just below the cutting blades (known as *Khodi* in Marathi). The net is about a foot deep and a foot wide at the open end which is fixed to an iron ring. When the stalk of the fruit is cut, the fruit falls into the net. In the case of a big tree a big net (called *zela* in Marathi) is kept hanging to a branch in which the picked mangoes are gathered by the operator. When they are taken to the ground, they are put either into baskets or carts which are lined from inside with green mango leaves and sent to the ripening place known as *adhi*, which term is also used to designate a single set of pile where alternate layers of hay and mangoes are arranged for ripening.

Care is required to be taken to avoid fruits falling to the ground from the tree as such fallen fruits do not ripe well and rot specially at the point of shock. "*Pad*" fruits wind-falls and those damaged by hails &c are of no use for artificial ripening.

The ripening place is generally divided into two portions one part where mangoes are spread for cooling on the bed of green

mango leaves and the other, where they are arranged in alternate layers of hay and mango in a pile, for ripening.

A bed of about four inches in thickness of green mango leaves is prepared in a good ventilated room over which the mangoes brought from the plantations are left exposed for nearly two days. The place of actual ripening is usually dark and is not well ventilated being kept closed for a greater period of the day. After two days ' exposure the mangoes are taken to the ripening chamber. A thick layer of hay nearly six inches is spread near the wall or in the corner of the room, measuring six feet long and theree feet broad, over this a layer of mangoes is arranged, one fruit just touching the other but not over it, measuring five feet long and two feet broad, leaving a border of hay of six inches on all sides. Over this a layer of dry grass or hay is spread about four to five inches thick and again a layer of mangoes and so on, five or six such layers of mangoes are arranged in one pile (*Adhi*). In a room of 20 feet by 12 feet there can be arranged five or six such piles. On the uppermost layer of mangoes a thick layer of hay about a foot, is put as a covering. Generally the dry grass of Iseilema whight (*sheda in Marathi*) is used and that of Ischasmum sulca (*Pawna* in Marathi) is avoided. For supeior varieties as *Pairis* and *Alphonso*, rice straw is used wherever. In arranging mangoes care is taken to remove the fruits which do not ripe but only rot as "*Pad*" fruits damaged by falls, birds &c. These when present begin to rot and the rot is spread by infection to the neighbouring ones. Generally rotting begins at the stalk end as it is the easiest way for the bacteria to enter.* Sometimes few onions say five or six are kept in each layer as they believe that their presence improves the colour and flavour of the fruit But it is found that there is no special ground for this belief.

In this condition they are kept for seven to eight days. After four or five days the pile is examined to see whether there is any tendency of mangoes for early ripening, by carefully introducing a hand in each lyer and examining one or more mangoes. In case of early repening the operation ends even at the end of six days.

When the mangoes are ripened (to know the right stage of ripening is a matter of experience) they are carefully removed from the hot bed and are spread out on a bed of hay to cool for about four to five hours. Then the baskets are filled with these and hay, in

* Bulletin No. 103 of 1920 of the Bombay Agricultural Department.

alternate layers and taken to the market for sale. The mangoes ripened in this way keep only for about two to three days after which they begin to be overripe and rot. Under ordinary circumstances in a successful ripening rotted mangoes do not exceed 5 p.c.

In case of costly varieties such as *Pairi Alphonso* and other very good country varieties, the pile may consist of only two layers as these ripen without much difficulty and there is less rotting. These when ripe also keep well and hence are generally the most suitable ones for being sent from one place to another. It is done by packing them in a basket or a ventilated wooden box in semi ripe or unripe condition with hay in alternate layers. For exporting to longer distances cold storage method is used. The mangoes when required to last longer for sale or otherwise are not kept in a heap but generally spread over a bed of hay specially rice straw. The usual period of keeping the *Pairi* mango from the date of plucking to the date of commencement of rotting is a fortnight and that of *Alphonso* is little over three weeks.

(*To be continued*)

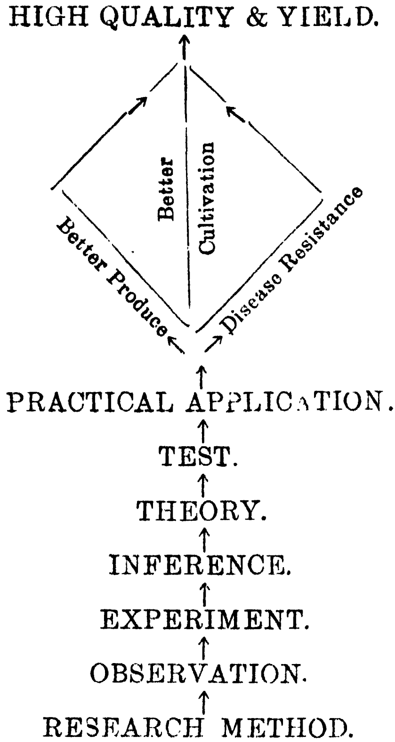
RESEARCH SECTION IN THE PRESIDENCY AGRICULTURAL SHOW HELD IN OCTOBER 1926.

BY

PROF. G. B. PATWARDHAN, B. Sc.

(*Ag. Economic Botanist to Govt. Bombay, Poona.*)

One of the most interesting sections of the Exhibition was that which contained exhibits illustrating various stages of researches on crops which are being carried on by the departmental experts. These exhibits were housed in the Botanical Laboratory of the Poona Agricultural College. They were arranged in an attractive manner on three stages with explanatory charts, diagrams and statistics on the walls behind. The principal wall had on the upper heights...the following epigram which brought home to the cultivator the relationship of research to the Agricultural improvement of the country.



The exhibits covered 11 important crops and included many other subjects illustrating treatment of crops against their insect and fungus enemies and of removal of weeds and also regarding improvement of grazing lands. To go over each of these serially, we shall commence with Cotton—one of the most important crops of this Presidency and one which is receiving special attention at the hands of many investigators in India.

Cotton Physiology :—Progress of research in Surat.

Research is carried on in Surat which aims at finding out the conditions which cause the shedding of the flowers and bolls and determining the retention of them on the plants. The importance of the research consists in the fact that more bolls held to the last on the plant, more cotton crop.

It has been found that a plant bears 300 flower buds out of which 80 open into proper flowers and finally only 34 bolls give Kapas. These 34 ripe bolls give about 15–14 oz of Kapas. If all 300 flower buds grew into mature bolls, they would produce 10 times more Kapas (this is arrived at by calculation.)

The things to be seen were :—

(1) Chart showing all buds (300)

(2) Chart-all 80 flowers and the shed buds below.

(3) Chart No. 3 final 34-mature bolls and the shed bolls below.

There were models showing :—

(1) One hypothetical plant showing all flower buds developed into bolls if no shedding occurred.

(2) Cotton plant showing the normal number of bolls per plant as seen at present.

(3) Cotton plant protected from boll worm showing nature of growth actually taking place.

(4), (5) & (6) Three varieties of cotton plants, showing that other varieties besides the Surat varieties also shed buds & bolls.

(7) Bottles containing shed buds and bolls were also placed.

Cotton Breeding:—Samples of the selected types were to be seen with the following information regarding each on walls, charts and lebels. Results of researches on Guzerat cotton :—

Surat 1027 A. L. F.	Yield 479 lbs. Ginning p. c. 36.3 or 36.4 Value Rs. 128 Khandy 1925–26 Rs. 425 to 450.
Surat Deshi—	Yield 545 lbs. Value Rs 116 per acre. Ginning p. c. 85.3. Valuation per khandy (784 lbs.) Rs. 410
1 A Cylindrical Boll :—	Yield 406 lbs. Ginning 37.3 p. c. Valuation per khandy Rs. 435 in 1925–26.
Broach Deshi 6 :—	Wilt resistant. Ginning 32.4 p. c.
1 A Cylindrical Boll 9 :—	Yield 445 lbs. Ginning 39 p. c. Valuation Rs. 435 in 1925–26.
Ghogari E 5 :—	Intermediate Bolls. Ginning 50.4 p. c.
Ghogari B 21 :—	Boll Rong tapering. Ginning 44.9 p. c.
Ghogari C 22 :—	Boll small, sperical Ginning 46.6 p. c

Ghogari A :— Boll special.
Ginning 44.2 p. c.

1027 Surat 5 ;— Yield 601 lbs.
Ginning p. c. 38.4
Valuation Rs. 460 in 1925-26.

Researches on cottons of Dharwar :—

Dharwar No, 1 a stain of Kumpta Cotton selected for staple.
Yield 540 lbs.
Ginning p. c. 28.
Staple 1″
Price Rs. 220.

The extention of area of cultivation from 1916 to 1926 is from 1000 acres to 120,000 acres-

Dharwar No, 2 :— A strain of Kumpta Cotton, selected for wilt-resistant character.

Dharwar I X Rosea :— A pure strain obtained by crossing. It gins 34 p. c. and has good color, staple and yields well.

Gadag 1 :— A strain of Dharwar American...selected for quality and quantity.
Yield 290 lbs. per acre.
Ginning p. c. 34.
Staple 7/8″
Price Rs. 250 per Dokra. The extension of acres of cultivation from 1917 to 1925 is from 1000 to 120,000

Dharwar American :— New Orleans cotton introduced by the East India Company in 1830 acclimatised in Dharwar :—
Yield 250 lbs per acre.
Ginning p. c. 29.
Staple 6/8″
Price Rs. 200 per Dokra.

Khandesh Cotton :— Progress of and results of research at Dhulia.

N. R. Cotton :— Ginning 36.37 p. c.
Valuation per khandy Rs. 335.
Flowers...White.
Leaves...not so deeply lobed.
Bracts & boll...small.
Staple 2 c. m. or 6/8″
Counts...8

B XX 27 :— Bani-Comilla Hybrid
Ginning 36.37 p. c,
Valuation Rs 371
Flowers...Sulphur coloured
Leaves...Deeply lobed
Bracts & boll...Big
Staple...2.8 c. m.
Counts 20 or 7/8″

B XI 9 (34) :— Bani-Comilla Hybrid
Ginning 36 p. c.
Valuation Rs 384
Flowers...Sulphur white
Leaves...Deeply lobed
Bracts Boll...Big
Staple 3 c m or 1″

B XX and B XI 9 (34):—Are both improvements upon the N R. Cotton.

Their valuation is more by Rs. 35 to 48; their staple is more by about 1/8″ and their counts are higher by 12 than N. R.

Improved Tobaccos:—Results of trials of breeding at Nadiad :—

1. *Gandiu* (local) yields 1388 lbs and brings Rs. 231 per acre.
2. *Gandiu No. 6* (selected strain) yields 1584 lbs per acre and brings Rs. 237 per acre.
3. *Movadiu* :—(local) yields 1298 lbs per acre.
   Movadiu :—No. 20 (selected strain) yields 1397 lbs per acre.
4. *Shengiu* :—(local) yields 1159 lbs per acre.
   Shengiu :—No. 22 (selected strain) yields 1300 lbs per acre.

Other varieties tried at Nadid are No. 70 white Barley ; Adoock; Strain No. 30 etc.

Breeding of jowars :—Ear heads and grains of the sections from Dharwar (Karnatak) and Surat (Gujarat) were tastefully exhibited.

Among the Dharwar ones.........Mahisal is a very vigorous growing variety with well formed cylindrical heads.

Muddinandyal :—has remarkbly large grains and *Chauri* has small white grains in a loose panicle.

The Surat varieties are remarkable in many respects. In this one finds large grains, small grains, covered grains, pearly white grains, large splendid ear heads etc Descriptions of individual varieties are given on lables.

The variety Althan Deshi is selected. It gives 887 lbs of grain, while local one gives 778 lbs per acre.

Bajri Research :—The progress of research at Poona :—

Aim :—To find high yielding strains. Numerous varieties of Bajri from several localities in Bombay Presidency have been studied. Variations in ear heads may be seen in a frame. Among the types selected so far...it is found out that non-hairy plants have yielded 48 p.c. more than with those with hairs all over the leaf.

More tillering is associated with more yield A variety from Bijapur shows promise of success so far, among the ones introduced here. It is more consistent than others with regards to behaviour of high tillering, good size of ear heads though late.

Groundnuts :—Progress of research at Poona.

Freshly introduced varieties along with Dharwar local ones were shown *of the former* :—

(1) Improved Spanish Peanut.
(2) Virginia Bunch and
(3) Virginia runner are found to give more fruits than similar ones under cultivation.

One chart showed flowers which curiously enough drive the fruits underground for development.

Safflower :—Results of research done at Poona.

Twenty varieties originally tried at Pusa were transferred to Poona for trial in Deccan. Out of these Nos. 6 and 7 have been found better than the others :—

Variety No. 6 :—	Yield per plant 123.78 grams.
	Oil p. c. 31. 05.
Variety No. 7. :—	Yield per plant 116·45 grams.
	Oil p. c. 32·60
Local :—	Yield.
	Oil p. c. 28 or 29.

Castors :—Research on this crop has been very recently undertaken. Selection for high oil content and high yield is begun. Samples showing wide variations in color, size, of seeds and in color, prickles, size of fruits were shown.

Research on Wheat :—Object of the research :—Improvement of the local hard yellow wheats by selection or hybridization in order to evolve high yielding, rust resistant types with good quality.

Method employed:-Very nearly the same as that used in rise mentioned under " RESEARCH IN RICE " Earheads of selected wheat strains which have shown constancy in their good behaviour for several years were shown together with a few dried plants and bottled seed samples. Photographs illustrating the study of cultures in the Ganeskhind Botanical Gardens and the standing crop of wheat grown with the selected strains on the Jalgaon Farm were put up.

Hybridization has been under way to evolve rust resistant types with good yiald and quality. But the results are not yet sufficiently conclusive.

Research in Rice :--Object of the research. Improvement of the Kolamba variety of rice which is largely grown in the North Konkan and has a great demand in Bombay.

Method of research :—(1) So far this has been by way of seelction of high yielding and fairly fine grained types from the existing local samples. Strains No. 42 is the best all round Kolamba Strain selected in this way. This was isolated as a result of very close comparative study of the different selections under fairly uniform conditions. This method was illustrated by various photographs shown dierffent points such as special trayseed beds for preventing accidental mixtures; bagging of plants for preventing natural cross fertilization plant to plant study of various important characters; careful comparison by replication of the comparable types; standing crop of strain No. 42. Earheads of the various selected strains were also shown. These gave an idea of the size and density of the earheads and size and shape of the grains. The anatomical structure of the stem of the standing and lodging strains was illustrated. Comparative behaviour of strain No. 42 under different characters was graphically represented so as to show the seasonal variation from 1921 to 1925. The comparative statement of different strains showing their behaviour under different characters was specially instructive. It, showed at glance not only the behaviour of a single strain from year to year but along with it that of other strains also under fairly uniform conditions. Method of keeping records for statistical study of the various characters was represented. Diagrams showing the comparative yields of the local samples and selected strains especially No. 42 and 79 were put up. Paddy and milled rice samples were also been shown in bottles.

(2) Improvements of the Kolamba crop by the hybridization method is also under way. This was illustrated by photo-

graphs showing the method and material used in artificial crossing in rice. Earheads of the parents crossed and of the first germination hybrids were represented.

(3) Earheads of some important or curious varieties of rice were shown to give an idea of the variation in different characters.

Improvement of Grass-Lands :—There were photos which show the good effects of enclosing land and artificial reseeding. One could see very thick vegetation in such areas in contrast with other lands which were not enclosing (see photos) and which were practically devoid of vegetation.

There were two big framed charts showing that by protection the quality of the soil improves along with the vegetation on it.

(1) A photo of a grass called Kholapuri grass with an actual sample of it could be seen. This is most suitable as a nurse grass for helping the establishment of good grasses on poor lands.

Photographs were also put up.........showing methods of improving pastures adopted with success in America. The details were:—

(1) Topography and vegetation of grass-lands before improvement.

(2) Results of protection, deferred grazing, rotational grazing and facilities for water and salt.

Mounted specimens of grasses peculiar to particular soils in Deccan were exhibited.

Bottle Siloes :—Small bottles containing grasses and other green stuffs of fodder-value compressed .as sample siloes to indicate that the same thing could be done on a large scale in ground or above ground siloes.

Research on weeds :—*Lantana*.........This plant is a terrible weed in forests and also on edges of fields and canals.

Photographs showing an infested forest and its root systems were shown. Dead stump of a lantana plant cut close to ground and poisoned was shown and a chart-showing the method of treatment and the formula of the poison used were to be seen close by.

Canal weeds were placed in glass jars and one photograph showed weed.........occurrence in the bend of a canal. Specimens of underground tubers of acquatic weeds, some of the germinating also were also placed.

Mimosa pudica is a bad pest in Kanara. Actual plants and their root systems were seen. Research as to its destruction had been investigated.

Eradication of Lavala weded:—Various mounted Lavala specimens showed the methods of development of tuber-colonies in the soil. The rhizomes produce vegetation plants as well as tubers and can go to a depth of about 3 and occupy about 30 cubic feet or even more. The methods of proceeding further into the soil " droppers " was shown on a chart. The method of reproduction both by tubers and by " seed " was also illustrated. A section of soil was worthy of inspection. A chart showing the methods of eradication of the weed so far known was also put up.

Gummosis Disease of Mosambi Plants:—Here were placed 5 plants one healthy and four inoculated with the fungus *Phytopthera* causing the gum. Exudation of gum on stem and on branches of infected plants were to be seen. Photoes showing different stages of the disease in nature and its effects on the plant were placed.

Fruit Rots of Mosambi :—The disease is brought about by Fungus attack (*phytopthers*) Fruits touching or near the soil get infected. Fruits from near the soil and inoculated ones were placed and a disease common to both could be noticed.

Potato wilts :—Bottles were placed containing tubers showing dry rot bacterial ring, scab and black heart.

Pots showing wilts.........due to Rhizoctonia, ring and fusarium were shown side by side with healthy ones obtained by good seed and good soils.

Cotton wilt :—Research on this is carried on at Dharwar. Here are shown two rows of Porcelain pots with cotton seedlings. Soil in one of them was sterilized and in the other it was infected with wilt disease fungus. The plants in the first were quite well and while in the other they wilted.

Research on spotted boll worms on Cotton at surat :—There were 4 charts hung on walls. They were :—

1 Life history of the boll-worms which attack cotton plants in shoots, buds and bolls.

2 Showing the damage done by the boll-worms to the different organs of the cotton plants viz shoots, flower buds and bolls.

3 Showing graphically the number of weekly flowers and the relative No. of flowers that finally developed into bolls and those that are shed due to the injury of the boll-worms. In the first few

weeks the damage of the boll-worms to the flowers is more than in the latter part of the season.

Similarly another diagram in the lower half of the chart showed the flower buds and the bolls damaged by the Boll-worms during the whole season and the proportion of them that finally gives Kapas.

4 Life history of an important parasite of the boll-worms. (Microbracon Lefroyi)

5 There were two cases showing the different stages of the life history of the two species of boll-worms.

6 There were three glass cells containing soils which showed that the moths could come easily out of the soil if it was in clods but not so if the soil was in a layer of about 2" thickness and was fine.

7 The methods of rearing of the boll-worms and the parasites were also shown.

Research on jowar (Andropogon sorghum) stem borer :—

Chilo Simplex :—The charts showed the following :—

1. Different stages of the pest with the average period that the pest takes in every one of them to finish one brood which on an average takes a month and a half.

2. How the pest lives from season to season to infest the new crop. The hibernation of the pest was pointed out.

The proportion in which the caterpillars hibernate in Jowar Kirbee stalks and stubbles as found at the harvest time. It is proved that the stubbles are a real source of danger and that about 50 p. c. of the caterpillars hibernating in them emerge out into moths.

3. The results of various trials of exposing stubble to Sunheat showing that the larvae inside the stubbles die after a month's exposure while about only 20 p. c could live in cages after three month's exposure under Surat conditions.

4. The effect of subjecting the hibernating caterpillar to artificial dry heat point out that they all die within a few minutes with 170° F.

5. The affected Jowar plant...with a dead heart was shown. Such plants have been known to contain about 60 p. c. of the total living borers in a field. Their destruction before throwing the crop was recommended.

II. Besides, the following were also exhibited :—

1, Different kinds of damages done by the borer.

2. The places where the caterpillars lie in the resting stages.

3. Other crops and grasses on which the borer is able to feed.
4. The specimen of all borers in Jowar and their life histories with their parasites.
5. The rearing of the borer and the parasite.
6. The usefulness of chaff cutters in controlling the pests.

In addition to the presentation of the various phases of research in this section, there were duplicates of the exhibits in the field where one could test the truth of what was shown here. Thus one could examine and make sure whether or not the cotton called 1027 A. L. E. was superior to Surat Deshi by seeing the plants and feeling the lint and similarly Dharwar No. 1 was an improvement upon the old Kumpta and so on.

The exhibits constituted in reality a full and detailed review of all research work done by the Agricultural Department during the course of the last 20 years of its activities and as such it was highly gratifying to the minds of the most inquisitive and intelligent of the visitors who saw the exhibits.

TRANSECT SURVEY OF GRASS FROM LONAVLA TO SIRUR.

BY

PROF. L. B. KULKARNI, M Ag.

:o:

Introduction.

This kind of transect survey of grass from Lonavla to Ahamadnager comprising about 120 miles was first proposed by Dr. Burns the Joint Director and the Grass Committee approved of it in April last with a view to study the corelation between Physiognomy and the Climatic and Edafic conditions. Owing to other work on hand, only a part of it viz. from Lonavla to Sirur comprising of about 80 miles was undertaken by me in November and December after the Presidency show, when the season had advanced much. So the observations are not only of one season but limited to the latter part of the season.

Observations were made in all of 16 stations approximately at every five miles and half a mile on both sides at every station. Intensive observations were made at stations where there was a distinct mark of transition in vegetation.

The whole line from Lonavla to Sirur may conveniently be divided into 3 parts according to the Topography, Climate especially the Precipitation and the Vegetation. and they are I. Lonavla to kamshet; 2. Kamshet to Talegaon; 3. Talegaon to Sirur.

General.

Topography-The line from Lonavla to Kamshet of about 9 miles offers a peculiar topography. It is surrounded on both sides by the range of the Sahhyadri mountains which are very thick and running closely and parallel to the line as is seen from the adjoining map. Thus it presents a great valley with numerous springs running across the line. The sort of a topography has a great influence as will be seen later, on the climate and vegetation.

At Kamshet, the range on one side viz. to the east is abruptly broken while on the other side, it continues though getting thinner gradually, and entirely broken at Talegaon. So this kind of topography from Kamshet to Talegon of grass in which the range is broken and the hills entirely absent on one side and the range though present, getting thinner on the other, presents a wide open area on one side and a close valley on the other side. The climate and the vegetation are differently influenced by this kind of topography.

The third part viz. from Talegaon to Sirur comprising of about 60 miles has practically no hills except small humps that are few and far between at stations 10, 11, 14 and aggregate at station 15. It will be seen later that such humps scattered here and there along the line, have practically no influence on climate and vegetation. So in this there is a vast area of open plain land, on both sides.

Rainfall.—Since rainfall is the important factor in climate and regulates it, it has been described below. It is between Lonavla and Kamshet on an average about 146 inches. The climate is cooler almost all the year round probably on account of the greater humidity through-out.

From Kamshet to Talegaon where the range on one side is abruptly broken and getting thinner on the other side, the rainfall is also abruptly reduced to 50 inches and the climate fairly dry for a greater part of the year except during season.

While from Talegaon to Sirur where the hills are practically absent and the land is plain and open, the average rainfall is still less only 23 inches; the climate is quite dry through-out the year except during the season.

Soil.—The great valley from Lonavla to Kamshet presents only two kinds of soil viz. soil on the hills and soil in the valley. The former is shallow, murumy derived from trap and red in colour; and the latter is deep yellow in colour and clayey in nature also derived from trap.

From Kamshet to Talegaon there will be seen 3 kinds of soils viz. the low lying soil, the slopes of the hills and the soil on the hills all derived from traps. The first is deep, mostly black in colour and clay in nature. The second is medium not exceeding 6 inches in depth light or medium black in colour and well drained. The third is shallow, murumy or rocky and fairly red in colour.

From Talegaon to Sirur, the valleys are not so prominent and their place is taken by good soil then the flat shallow soil and the hilly soil all derived from trap. The good soil is generally deep, black in colour and clayey in nature. The flat shallow soil is murumy, poor, light in colour. The hilly soil also is shallow murumy or rocky either light or light red in colour sometimes covered with stones large and small.

General crops—In the valley, rice is the dominant crop. From Kamshet it gets less gradually in extent and wheat and jowar grown though limited in the eastern side. At Talegaon, only coarse variety of rice is grown; in its stead other crops such as wheat, jowar both kharif and rabi are grown. From Talegaon these crops but less in extent and Bajri and other millets are common.

Physiognomy.

It is proposed in this short paper to describe first the vegetation of the two end stations of the line where the physiognomy is quite different and then of the intermediate stations where there is a distinct transition in it.

Lonavla.-Here on account of the heavy rainfall and the favourable climate throughout the year, tall growing forest trees such as Mangifera indica, L, Eugenia jambulana L, Tectona grandis Thespesia populnea Scoand and Erio dendron anfractuosum Dc are common; besides, Lantana camera L, Vitex negunde L, Pogostemon parviflours Bth and Carissa carandas L are frequent.

Although the climate and rainfall are favourable to tree growth they are not so to the grasses. There grow only limited species and they too are not good fodders.

In the low area where the soil is yellow clay and more than 5 feet deep with soil moisture 13.6 p. c. determined in December 20-1926 Andropogon odoratus Da Lisb, Pollinia argentea Trin and Ischaemum aristatum L are dominant; Alundinella agrostoides Trin fairly common An this teriea celiata found though rare. Rice (Oriza satival) is the general crop in such low areas as has been stated above. The following weeds are frequent either on the bunds of the rice fields or associated with grass on the grass area :...... Eupherbai pychnosteiga Bois, Et dracunculoides., Geissaspis cristat Ammania baccifera, Spheranthus indicus.

Cyathocline lutuea lan and C. lyrata can are the general weeds in such places.

On uncultivable soil 5 inches deep red in colour cevered with small stones and with moisture 6.32 p. c. determined on 10th Dece 1926, Andropogon contortus perennial is dominant and Anthistiria imberbis Retz, Andropogon schoenum and Ischaemum laxum Br. subdominant.

A very interesting point to note is that on the rocks Rottboelia divergens HacC and Aneilema paniculacum Wall are the pioneer grassses instead of Oropetium Thomaeum Trin and Cyanotis fasciculata schult found round about Poona. Ischaemum ciliare if often frequented with Rottboelia.

Sirur:—This is the other end of the line where the climato, rainfall and vegetation are quite different.

This station is almost treeless and the only trees that are seen few and far between are Acacia arabica, Wild Azadiracta indica Juss and Capparis aphylla Roth.

On good soil medium black fairly clay about 42 inches deep and with moisture 17.4 p. c. as determined on 20-12-1926, Andropogon annulatus Forsk, A pertusus Wild are the prevailing species; Panicum isachne, Rith, Aristida funiculrta Trin and A. adscensions L are usually scattered. Aristolochia bracteata Retz is distributed throughout the area.

Poor soil of uncultivable land slightly red in colour and murumy in nature about 8.5 inehes deep and with moisture 7.16 p. c. as determined on 20-12-1926, is generally overgrown with Aristida funi culata Trin frequently associated with Indigofera cordifolia Heyne. On such soils Andropogon pertusus Wild, A. foveolatus Del and A. monticola Schult are scattered.

On the hills where the soil is fairly red in color about 3 inches deep strewn with stones as large as cocoanuts and with moisture 14.02 p. c determined on 20-12-1926, is growing Ischaemum laxum Br exclusively as dominant species. Shrubs and bushes are absolutely absent.

Stations showing transition in Vegetation.

Kamshet :—Here on account of the absence of hills on one side and the reduced rainfall, there is a different physiognomy. The trees that are common in the valley are less is extent and Acacia arabica Wild is getting in. Rice (Oryza sativa) is also less and in its place other dry crops such as wheat and Jowar are grown. Grass species are increasing in number and extent.

The most common grass species viz Andropogon odoratus Da Lisb Pollinia argentea Trin and Ischaemum aristatum L are waning gradually in low level and in their stead, Andropogon annulatus Forsk, Anthistiria ciliata Retz and Pennisetum alopecuros Nees are growing though limited; soil being medium black about 27 inches deep and with moisture 18.4 p. c determined on 9-12-1926. One marked thing was that the stems of A. annulatus Forsk were pink in color and poor in growth. Other weeds also of the dry tract such as Indigofera linifolia Retz, Heylandia latebrosa Dc and Alysicarpus rugosus are replacing though limited the common weeds that were found in the valley.

On the rocks the pioneer species such as Oropetium Thomaeum Trin and Cynotis faciculate L though meagre in growth are appearing and the usual ones viz. Rottboelia divergense Hack and Aneilema paniculatum Wall are less in extent and poor in growth.

Talegan :—The transition in vegetation much more marked here according to the change in climate and rainfall.

The common trees such as Mangifera indica L, Eugenia Jambulana L, Thespesia populnea Soland and Eriodendron anfractuosm Dc are almost rare and found only along the living valley. Acacia arabica Wild is increasing in extent and A. leucophluea Wild also adding.

Rice is much decreasing and only coarse varieties grown; dry crops are increasing and Bajri (Pennisetum typhoideum) Rich is added.

7

In low area of deep black soil clay 24 inches deep and with moisture 33 p. c. determined on 9-12-1926, Pennisetum alope curos Nees which was rare so long is dominant; Andropogon annulatus Forsk Pollinia argentea Trin and Iseilema laxum Hack scattered. The rare weeds being Spheranthus indicus L and Exacum pumilum Grisb.

Andropogon contortus perennial L, A. schoenanthus and Anthistiria ciliata Retz which occupied the high hills as far as Kamshet, are now growing on the plain with shallow soil fairly black 1.5 inches deep strewn with stones fairly large with moisture 4.90 p. c. Thelepogon elegans Roth which was not seen from Lonavla to Kamshet is seen growing here.

Other weeds of the dry tract such as Vicoa auriculata Cass, Indigofera linifolia, Glossocardia linearfolia, also seen though scattered.

Andropogon contortus annual so far absent, fairly common though in patches on soil 3 inches deep and with moisture 5.62 p. c. determined on 8--12--26. Aristida funiculata Trin also not seen so long is seen growing on still shallower soil 1 inch deep and with moisture 3.86 p. c. determined on 8-12-26 though scattred. Andropogon monticola Schult, A. triteceus and A. purpureo sericeus drought resisting species that were not seen so long commence to appear though limited from here especially on the eastern plain which is open and hence dry throughout the year except during the room ; the soil being either light or medium black 6 inches deep and with moisture 8·9 p. c. determined on 8 December 1926.

The pioneer species on the rock such as Rottboelia divergens Hack and Aneilema paniculatum Wall are entirely absent here and replaced by Oropetium Thomaeun Trin and Cyanotis fasciculata L which are the usual pioneers on the rocks round about Poona.

THE ANNUAL REPORT OF THE ANNAPURNA FARM,

BY

H. G. BANE (Farmer).

(Santi-Bastwad Dt. Belgaum for the year 1926-27).

The Annapurna Farm of Mr. Bane-a Progressive Farmer is situated at Santi-Bastwad – a village at a distance of seven miles from Belgaum. It is in the Mallad tract of the Belgaum Taluka with a rainfall ranging between 40 to 60 inches. This is the seventh year since its inception and the area under cultivation during the year under report was 25 acres. Out of these four acres are under garden crops and the ramaining under Paddy aud other minor crops.

Looking to the figures of receipts and expenditure this seems to be a very successful year. On the whole he seems to have made some profit for each and every crop excepting Potatoes which were damaged owing to heavy rains. Coming to actual facts and figures it is seen that from 22 acres actually under cultivation he has got about 1240 Rs. as net profit giving an average of about 56 Rs. per acre. To put it the other way Mr. Bane gets about Rs. 100 per month by cultivating about 22 acres. Had we any idea of the cost of the permanent establishment interest on his capital and the Depreciation charges we would know exactly the actual income.

However, as Mr. Bane says, the object of this report is to serve as a guide to those educated persons that intend going in for private farming and we thank Mr. Bane for publishing his experiences.

V. G. D.

SUMMARY OF THE OPENING ADDRESS,

BY

PROF. V. G. GOKHALE, Ag. PRINCIPAL.

Learned Colleagues and Pupils,

It is the practice to welcome the students on the opening day of the college and to address them a few words by way of advice. I have the honour and privilege to have that pleasure this year. Some of you have got the experience of the college for the last 2 years, some have for one year and some are absolutely new-comers to the college. I am addressing you, particularly the new-comers to make you conscious of what you are upto in this college, what your duties are, and what your responsibilities are. You have come to this college to study the subject of Agriculture.

The object in making your choice might be that you must have some means of occupation in life and also the love of learning. I certainly commend your choice because you have chosen for your study a subject on which all human life is dependent and which gives you an opportunity of exploiting the most honest treasures of production out of the elements.

Importance of Agriculture.

Agriculture is an art, a thorough study of which necessitates the help of other branches of applied sciences such Botany, Chemistry, Plant-Pathology &c, and therefore is dependent on factors beyond control. However the subject is full of interest.

The study of Agriculture may well be compared to a kind of scientific sport. It is an open air occupation which conduces to healthy life. There is every opportunity of displaying your skill. As in sports here also there are many occasions for defeats or failures as well for success. As a sportsman you should if you happen to lose be ready to lose cheerfully.

The subject of Agriculture is vast and the Progress is very slow. The practice of agriculture is quite an ancient occupation and the Indian cultivator knows much and has done much. Mr. Chadwick says in his report to Madras Government during 1915-16 :—

"The Indian Ryot succeeds in producing on land which would be despair of the western farmer and if he combined with his ability, knowledge of scintific methods he would have little to learn from the Agricultural science of the west".

It is often argued that in the subject like Agriculture, the small amount of information which a student can acquire at a school or college can be of little use when he comes to deal with practical affairs. But the main purpose of education is not to give information but to train main faculties for the subsequent work.

Methods of study in this College.

Now I shall tell you something about the methods of getting the education in the line of Agriculture. They differ considerably from the methods of getting education in other Colleges. You have not only to learn the meaning of words only but words and things and at the same time the art of applying the knowledge you gain in actual practice.

The subject of Agriculture is vast, complex and diverse. In whatever work you are engaged, keep your eyes wide open. Always try to put your knowledge to the test, compare the results you obtain and co-ordinate them. Be ever a student–meaning thereby that do everything with the object of learning something.

Try to acquire power of observation and love for manual work should be developed The looking into or inquiring into 'whys' and 'hows' should be so stimulated that your minds would be formed and fashioned to enable them to form constructive judgments.

In this college along with your lectures you have to do a lot of practical work. In the practical work you are placed face to face with facts and you get the opportunity of verifying the truth of theories you are taught in the class.

The incidental advantage of your field practicals is that you get open air excercise. It should be your aim that along with the culture of your body, you should try to build up your character.

This college like other institutions provides ample opportunities for sports, games and social activities.

In all your activities you must observe Discipline and Decency. Especially with regard to your dress it should be neat and tidy and at the same time decent.

It is complained that students living in this Hostel lead a rather extravagant life. So I have to advise to lead a frugal life and try to prevent all unnecessary waste.

Lastly I have to bring to your notice that you have got the excellent opportunity before you, make the best use of it in obtaining knowledge which will be of immense use to you in your after-life and help you to serve your country.

AN APPEAL.

—:o:—

On behalf of the *Bombay Agricultural Graduates' Association* it is desired to prepare a list of all the Agricultural Graduates passed since 1904 from the Poona Agricultural College. All the Agricultural Graduates (whether Members of the Association or not) are therefore requested to send in their names together with their addresses, (present or permanent if any) their date of birth, their date of passing the degree Examination, their present occupation &c.

All other persons as well, interested in their Agricultural Graduate friends are also requested to communicate the above information on behalf of their friends, or at least to communicate the addresses of their Agricultural Graduate friends to the Secretaries of the Association to enable them to approach the Agricultural Graduates themselves.

The information may kindly be sent as early as possible to the undersigned.

Poona
Dated, 26th June 1927.

V. N. GOKHALE,
S. R. GODBOLE,
Hon. Secretaries.
Bombay Agricultural Graduates' Association,
Agricultural College Poona.

A BASALT DYKE NEAR MULSI.

—(o)—

Basaltic dykes are found here and there in the Poona District. They are all upright and their peculiarity is that they have not caused any disturbance or dislocation in the strata of the basalt or amygdaloidal trap through which they have passed. One such dyke was observed by the writer when he visited Mulshi in March last. Mulshi is a small village about 27 miles from Poona where a large dam is being constructed. The dyke is near the waste weir at the north end of the Mulshi tank dam. It is about 70 feet below the top of the hill in which it is found. It runs north-south and is 20 feet in breadth. It has not disturbed any of the rocks on its sides but it seems that it must have been held there under great pressure. It is very compact and hard and on breaking splits easily into comparatively thin irregular slabs. The dyke where it comes in contact with the rock of the hill on two sides has a brownish coloured layer of about 6 inches in thickness while the rest of the portion is deep black in colour. D. L. S.

The Poona Agricultural College Annual Social Gathering 1927.

GENTLEMEN,

We, the staff and students of the College of Agriculture, Poona, invite the presence of all the past students of this College on the occasion of the celebration of the 20th Annual Social Gathering and Sports to be held on the 4th and 5th of August 1927.

The function aims at cementing the mutual tie of friendship and society between the professors and students, past and present.

We earnestly hope that all the past students will heartily respond to the call of the ALMA MATER by gracing the occasion with their presence and co-operating with us in making the function a grand success.

Any spontaneous out-come of help by way of contribution will be quite welcome at the hands of the General Secretary.

R. G. BHAVE,
Hon. General Secretary.

COLLEGE NEWS AND NOTES.

:o:

The College reopened after the vacation on the 10th of June. Many new faces are seen and we extend our hearty welcome to one and all of them and congratulate them on their worthy choice of this profession.

* * * *

The list published elsewhere in this issue gives the names of the successful candidates in the Degree as well as Diploma Examinations. We heartily congratulate all those who have passed especially our new graduates who are sent out into the world to diffuse among the public the knowledge they have gained here. We have no doubt that they will bring glory to themselves and to the institution which has keenly watched their progress. We hope that they will cherish the memory of their pleasant college days and request them to continue their connection with the college by becoming subscribers and contributors to the magazine.

* * * *

With the opening of the year there has been a few changes in the staff. to some of which we have alluded in the beginning. Besides these Mr. K. S. Kulkarny is appointed as Ag. Asst. Prof. of Agriculture and Mr. T. N. Chaugule, Demonstrator in Agriculture is transferred to Loni School. Our best wishes go with him. Mr. M. B. Ghatge is appointed in the vacancy.

* * * *

Elsewhere we published the Secretary's invitation to all the past students for the Annual Social Gathering in August: We hope that they will take this opportunity to mingle with the staff and students and taste the pleasures of the college day once more.

GYMKHANA NOTES.

The last General Body meeting of the year 1926-27 took place on the 11th of February 1927 to elect the office-bearers for the year 1927-1928. The following gentlemen were elected for the various items shown against their names.

Hon. General Secretary	B. Ishwarlal
Tennis "	S. K. Jathar
Cricket "	D. K. Makhijani
Foot Ball "	H. Agha
Hockey "	D. D. Upadhya
Athletics "	S. Madhava Rao
Gymnasium "	N. P. Shah
Minor Games "	J. M. Trivedi
Reading Room "	M. D. Vora

Magazine Committee.

President–Rao Bahadur P. C. Patil, L. Ag. M. Sc. (Wis)
Editors—Mr. V. G. Deshpande, B. Ag.
Mr. N. S. Menon B. A.
Senior Manager—Mr. D. G. Kulkarni
Junior Manager—Mr. R. V. Chitnis

The first meeting of this year was conducted on the 27th of June and the following additional office bearers were elected. Unfortunately Messrs. Jathar and Chitnis were not able to turn up and others were elected in their place.

Hon: Sec. for Social Gathering	--Mr.	R. G. Bhave
Tennis Secretary	,,	D. G. Desai
Junior Sec. for A. A. and D. S.	,,	Ramchandra
Junior Manager for Magazine	,,	P. S. Kulkarni
Member without Portfolio	,,	S. B. Keskar

The Cricket Season has opened and all are actively taking part in the game. We have every hope that with regular practice our team will be able to conduct itself successfully in the Inter Collegiate sports. The Gymnasium and the Reading Room also have begun their work in earnest. One noteworthy feature is that this year the students are very eager to take the fullest advantage of the Reading Room. We hope that this enthusiasm will not wane away after a few days.

Along with the Social Gathering the College Sports also will be conducted. We hope that all will begin regular practice and acquit themselves creditably in the items.

B. ISHWARLAL.
Hon: General Secretary,
Agricultural College Gymkhana.

OLD BOYS.

We are glad to hear of the appointments of Rao Saheb B. P. Vagholkar as Deputy Director of Agriculture and Mr. S. G. Bhalerao as Crop Botanist to the Government of Bombay.

* * * *

Mr. T. V. Ganpule, our new graduate, instead of hunting after Govt. Service, has taken up private farming. We hope that many more will follow his example.

ACKNOWLEDGEMENTS.

We have great pleasure in acknowledging with thanks the receipt of a copy of the book, प्राणिशास्त्र "Elementary Zoology" by the Late Balaji Prabhakar Modak, Late Professor, of Physical Science, Rajaram College, Kolhapur, from his son Mr. V. B. Modak.

We beg to acknowledge with thanks the receipt of a pamphlet. from the Union Agency, Poona City, containing the evidence given by their representative before the Royal Commission on Agriculture.

We are thankful to Mr, H. G. Bane of Santi Bastwad (Dt. Belgaum) for sending us a copy of the annual Report of his annapurna farm for the year 1926-27.

REVIEW.

'पशु, पक्षी व इतर प्राणि' BEASTS, BIRDS, AND OTHER ANIMALS.

Messrs. V. N. Gokhale and V. G. Deshpande have recently brought out a medium size book on "Beasts,Birds and other Animals" in Marathi. There are very few books in Marathi dealing with scientific subjects and fewer still are books giving accurate information about plants or animals which surround us. Little children are very eager to obtain information from their elders about the animals they see but the elders have, generally speaking, very little knowledge and hence they are not able to satisfy the thirst of knowledge of the younger folk. Messrs. Gokhale and Deshpande have therefore removed a great want by the publication of their book.

The arrangement of the book is systematic and perfectly scientific. In the beginning we find a short account of the origin, evolution and classification of the animal world in general. The whole subject matter is then divided into three sections—one dealing with the beasts, the second with the birds and the last with animals; which could not scientifically be included in any one of the above two groups. Each section begins with short lessons on the anatomy and physiology of the animals, their characteristics and habits in general and the methods of studying these. There are in all 47 beasts, 33 birds and 50 other animals described in the book. The

list practically includes all possible beasts, birds, insects and other animals about which we should have knowledge for one reason or another. Some of them are useful to human beings either because they supply food material or give work or act as friends while there are others which are dangerous because of their habits, or poisonous character or of their power of carrying disease. It is essential that we should have knowledge and correct knowledge of these. The information given in the book though scientific is written in a simple language free from technical words and the style of writing has made the book interesting. I have seen children reading this book as they would read any story book. The pictures given in the body of the book have made the book very attractive. The book is useful not only to school going boys and girls but also to grown-ups and teachers. The young will find in this book short story like lessons which will interest them while the grown-ups will find a fund of knowledge which they ought to possess but which is generally wanting. The book will prove to be very useful to teachers as a reference book. We take this opportunity of congratulating the authors for bringing out such a useful and interesting book and thus making a valuable contribution to Marathi literature. The price of the book is Re. 1-8-0 and can be had from any Marathi book-seller.

D. L. S.

OBITUARY

We are extremely sorry to record the death of Mr. S R. Katgeri G. B. V. C. the resident Vety Officer and Demonstrator in Vety Science on the 3rd of March 1927 at the College Vety Hospital. He died of Influenza with complications of cerebral meningitis and Pneumonia. He worked in the C. V. D. for a year or so and then his services were transferred to the College as a resident Vety Officer and Demonstrator by Vety Science and as such he worked for about 4 years. He was a quiet natured, hard working man, always willing to do any work in his line with a pleasant smile on his face, never sick or sorry. As a resident Vety Officer he has no doubt secured for himself a very good reputation amongst the various class of people who brought their animals for treatment to the hospital in this city. He leaves behind him his wife and two sons. Our sympathies go to these in their sad bereavement. May god bless his soul with eternal happiness.

UNIVERSITY EXAMINATION RESULTS IN AGRICULTURE FOR 1927.

EXAMINATION FOR THE DEGREE OF B. Ag. 1927.

Second Class (in order of merit)

	Name.	Special Subject.
1	Gosai Kanchangir Nengir,	Hort.
2	Shah Kantilal Mathuradas,	Ag. E.
3	Patel Purushottam Jhaverbhai,	P. B.
4	Ganpule Trimbak Vishnu,	I. S. C.
5	Pandya Pundarik Shivabhadra,	P. B.
6	Lodh Dinesh Chandra,	Ag. E.
7	Mandke Narayan Vinayak,	Hort.
8	Patel Premabhai Narenji,	I. S. C.
9	Ghatge Madhavrao Balasaheb,	Ag. E.
10	Gidwani Rijhumal Nanikram,	I. S. C.
11	Patel Himatlal Vanmalidas,	I. S. C.
12	Desai Maganlal Kasanji,	P. B.
13	Desai Tulshidas Hathibhai,	I. S. C.
14	Joshi Narmadashankar Adityaram	I. S. C.
15	Paracer Krishna Kumar,	I. S. C.
16	Sannabhadti Samba Kuppavya,	A. Chem.
17	Prithiwi Raj Y.	I. S. C.
18	Oka Bhalchandra Ganesh,	A. H. D.
19	Relwani Sadhuram Lokeram,	P. B.
20	Malkani Pritamdas Gulabrai,	Hort.
21	Sawant Sadashiv Yeshwant,	Ag. E.
22	Gokhale Dattatray Ramchandra,	I. S. C.
23	Inamdar Gangadhar Ramchandra	I. S. C.
24	Deshpande Krishnaji Wamanrao	Ag. E.
	PASS.	
25	Annigiri Lakshman Gururao	A. En.
26	Mahajan Shriniwas Bhimrao	Ag E.
27	Patrawalla Faredoon Manekji	Ag. E.

PASSED IN BOTANY AND PLANT PATHOLOGY.

28 Aiyangar Ranganath Shrinivas,
29 Bedarkar Vasudev Rao Krishna
30 Buranuddin Hussain,
31 Chellaramani Thadaram Tethanand
32 Dhumma Babasaheb Mallikarjun
33 Dutt Pusdut Kumar
34 Gazdar Dinsha Bomanji
35 Gujjar Dhanji Vali
36 Honap Sitaram Govind
37 Irani Bahman Ardeshir
38 Irani Rustom Aspendiar
39 Jani Manilal Harinarayan
40 Kawatkar Gurunath Parashuram,
41 Kondvikar Yashwant Kashinath
42 Kulkarni Digambar Gopinath
43 Kulkarni Laxman Gopal

44 Kulkarni Vasudev Kashinath
45 Lanewala Sadiqali Gulama-husain,
46 Makhijani Doulatram Kemchand
47 Marerikar Ganesh Sakharam
48 Mehta Anantrai Atmaram
49 Motafram Sohrab Dorabjee
50 Mulwani Bhagwandas Tejmal
51 Natu Rajaram Gopal
52 Parab Ramkrishna Narayan
53 Patel Mothibhai Nathabhai
54 Patel Somabhai Nathabhai
55 Patel Umedbhai Bhailalbhai
56 Patil Narayanrao Gopalrao
57 Tambat Manohar Balwant
58 Tipnis Bhaskar Bhikajee
59 Trivedi Jayantilal Manishankar
60 Vora Mansharlal Dhansukhram

PASSED IN BOTANY ONLY

61 Ishwarlal B.
62 Shah Nathulal Prabhudas
63 Thadani Kansing Pohumal

INTERMEDIATE EXAMINATION IN AGRICULTURE.

First class in order of Merit

64 Tarkunde Vithal Mahadeo
65 Araiu Abdulaziz Rahimbaksha
66 Thomas Kovoor Chumnar

SECOND CLASS.

in order of Merit.

67 Amin Kaunubhai Chotabhai
68 Gayawala Purushotamdas Mathuradas,
69 { Madhav Rao S.
Patel Apabhai Fullbhai }
70 Bhat Narsinh Ramkrishna
71 Gokhale Dattatraya Haribhau
72 Patel Maganbhai Vagalbhai
73 Upadhya Dulerai Chaganlal
74 Shahani Wadhamal Pritamdas
75 { Kulkarni Pramod Shankarrao
Upadhya Durga Dutta }
76 Naik Balwantrao Kasanji
77 Savanur Pandurang Krishna
78 Shah Kantilal Amritlal
79 Patel Vithalbhai Muljibhai
80 Jainapur Bhimaji Hanmant
81 Shantilal Bholashankar
82 Goswami Ramendra Nath
83 { Kale Vishnu Keshao
84 Kelkar Dattatray Gajanan }
85 Marwadi Govindram Totaram
86 Apte Nilkanth Shridhar
87 Desai Motibhai Purshottamdas
88 Patel Rambhai Bakrobhai
89 Divgi Ramdas Dattatraya
90 Deshmukh Martand Ramrao
91 Mahajani Shridhar Ganesh
92 Desai Dinkarrao Ganpatidas
93 Govandye Gangadhar Krishna
94 Dongre Sitaram Sadashiv
95 Hegdekatti Ganesh Mehadev
96 Palande Sadashiv Ramchandra
97 Zodge Narayan Ganpat
98 Nikam Bhagwantrao Ganpatrao
99 Nadkarni Vishweshwer Laxmanrao.

PASS CLASS.

100 Betigeri Anant Raghavacharya
101 Bhide Narayan Ramchandra
102 Chafekar Vishnu Sadashiv
103 Kurhade Shantaram Keshavrao
104 Naik Madhusudan Bhikajee
105 Patwardhan Vinayak Balwant
106 Shahani Tundamal Thotmal
107 Vakil Shankarlal Manilal
108 Yardi Hanmant Vyankatesh

DIPLOMA RESULTS.

B. Ag.

1 Jadeja D. K.
2 Poonaih R. E.
3 Patel M. D.

Passed in Botany and Plant Pathology only.

1 Don Eugine
2 Pillay S. K.

I. Ag.

1 M. Madhavan.

LIST OF BOOKS RECEIVED IN THE COLLEGE LIBRARY.

Shiv Datta—A paper on the Milk Supply of Lahore in 1921.
H. R. Stewart—The Economic Value of Goats in the Punjab.
C. B. Barry—The Rates of food consumption by Zamindars in Punjab.
... ... Questionnaire for Economic Inquiries.
Sardar B. Singh and Calvert—An Inquiry into Mortgages of Agric. land in Punjab.
H. R. Stewart—Some Aspects of Batai Cultivation in the Punjab,
B. Narain—Eighty years of Puhjab food prices.
R. Lall Bhalla—Report on an economic survey in the Punjab.
Mrs. Caleb—Family Budget of Clerks.
... ... Report of the Forest Grievances Enquiry Committee.
... ... Manual of Drill for Boy Scouts.
Gilcraft—Scouting out of doors.
... ... Live Stock Statistics 1924-25.
... ... Selected Reports from the Scientific and Tech. Dept.
W. R. Dunstand—Technical Reports and Scientific papers.
C. N. Vail &c.—Currency and Prices in India.
N. G. Ranga—Economic Organization of Indian Villages Pt. I.
R. H. Akhtar &c.—An inquiry into Mortgages of Agric. Land in the Punjab.
... ... Statistical Abstract for United Kingdom from 1900 to 1924.
... ... Do. for British Oversea Dominions.
B. H. Hibbard—Marketing Agricultural Products.
... ... The Canada Year Books for 1921, 1922 and 1924.
M. Clark—The Elements of Commerce for Beginners.
J. M. Keynes—The End of Laizzez Faire.
... ... International Year book of Agricultural Statistics for 1925-26.
M. A. Buch—Economic Life in Ancient India.
S. C. Bhattacharyya—Material Advantages of India under the British Crown
M. G. Ranade—Essays on India Economics.
... ... Handbook for Indian Students.
G. F. Shirras—Report on an Enquiry into Working Class Budgets in Bombay.
Do. —Report on an enquiry into Agricultural Wages in the Bombay Presidency.
P. B. Joshi—Early History of North Konkan.
G. M. Broughton—Labour in Indian Industries.
J. S. Nicholson—Elements of Political Economy.
... ... Speeches and Writings of Dadabhoy Naoroji.
T. N. Carver—The Distribution of Wealth.
F. R. Hemmingway—Madras Cooperative Manual.
V. G. Kale--Dawn of Modern Finance in India.
... ... Writings and speeches of G. V. Joshi.
J. H. Clapham--The Economic Development of France and Germany.
P. C. Prasada—Manual of Agricultural Cooperation in Denmark.
W. Barrett &c.—The Divinging Rod.
R. A. Fisher—Statistical Method for Research Workers.

E. Simkins—The Agricultural Geography of the Deccan Plateau of India.
V. G. Ranage—A Social and Economic Survey of a Konkan Village.
E. Clements—Lectures on Indian Music.
M. P. Lee—The Economic History of China, &c.
S. E. Rasor—Mathematics for Students of Agriculture.
E. Edsar—General Physics for Students.
Do. —Heat for Advanced Students.
R. H. Smith—Agricultural Mechanics.
... ... A Report on the Use of Windmills for the Generation of Electricity.
W. M. Bayliss—Life and the Laws of Thermodynamics.
O. Fabre—Reinforced Concrete simply explained.
V. S. Bryant—Map work.
F. H. Davies—Foundations and Machinary fixing.
F. A. Wirt—A Laboratory Manual of Farm Machinery.
G. H. Purvis—Agricultural Implements.
G. B. Patwardhan—An aid to the study of Crop-breeding.
J. B. S. Norton—Exhibiting, Classifying and Judging home made Products.
E. J. Russell—Plant Nutrition and Crop Production.
D. H. Campbell—An Outline of Plant Geography.
L. Darling—A Pensioner's Garden.
Thom C. &c—The Aspergilli.
H. S. Fawcett &c.—Citrus Diseases and their control.
P. S. Cane—Modern Gardens British and foreign.
G. J. Peirce—The Physiology of plants.
B. N. Uppal—Provincial list of the species of Septoria in Iowa.
H. H. Hume—The cultivation of citrus fruits (revised edition).
W. C. Coker—The Saprolegniaceae.
E. F. Smith—An Introduction to Bacterial Diseases of Plants.
F. L. Stevens &c.—Plant Disease Fungi.
H. P. Paranjpye—Fruit Culture (IN Marathi).
J. Wright—Horticulture.
A. Arber—Water Plants.
T. R. Sim—Tree—Planting in Natal.
E. M. Gress—The Grasses of Pennsylvania.
J. E. Weaver—Root Development of Field crops.
G. H. Cunningham—Fungus Diseases of Fruit trees in New Zealand.
... ... Berger's Manual of Determination Bacteriology.
... ... Laboratory Manual in General Microbiology.
L. Michaelis—The effects of Ions in Colloidal Systems.
A. R. Warnes—Coal Tar Distillation &c.
J. Hubner—Bleaching and Dyeing of vegetable fibrous Materials.
G. D. Forbes - The Present and the Future of the Food supply.
L. S. Palmer—Laboratory Experiments in Dairy Chemistry.
H. Finnemore—The Essential Oils.
D. Ellis—Practical Bacteriology for Chemical Students.
W. Ostwald—The Principles of Inorganic Chemistry.
C. H. Stephenson—Some micro-chemical tests of alkaloids.
N. K. Jardine—The Dictionary of Entamology.
L. T. Hogben—Comparative Physiology.
H. B. Forbes—Monkeys Vols I and II.
C. V. Riley &c.—Insect Life Vols 1 to 5.

T. D. Alen Cockerell—Zoology.
F. E. Bemis—The A. eorodids or Mealy Winged Flies of California.
C. T. Brues—Insects and Human Welfare.
V. G. Deshpande—Entamology (IN Marathi).
V. N. Gokhale &c.—Zoology (IN Marathi).
... ... Proceedings of the First Indian Poultry Conference.
... ... Madras Agric. Department Year Book 1925.
.. ... Ensilage.
J. B. Knight—The Existing State of Persian Agriculture &c.
L. J. Lord—Practical Butter and Cheese Making.
... ... Cotton Growing Countries Present and Potential.
W. H. Johnson—Cotton and Its production.
N. S. B. Gras—A History of Agriculture in Europe and America.
R. N. Salaman—Potato Varieties.
W. S. Hill—The Culture of Lucerne.
T. Mojonnier &c.—The Technical Control of Dairy Products.
V. E. Wilkins—Research and the Land.
G. H. Collings—The Production of Cotton.
M. D. C. Crawford—The Heritage of Cotton.

Department of Agriculture, Bombay

LEAFLET No. 1 OF 1927

List of Implements recommended by the Agricultural Department for Gujarat

A—Ploughs

		Price. Rs.	Sold by
1.	S. A. E. Gallows ...	135	Duncan Stratton & Co., Bombay.
2.	C. T. 1 ...	65	
3.	B. T. 2 ...	56½	
4.	Kirloskar No. 11 ...	26	Kirloskar Bros., Kirloskarwadi.
5.	Sardar ...	27	

All these ploughs do better and quicker work with comparatively less draught than the wooden ploughs.

The S. A. E. Gallows is a heavy landside plough specially suited for deep ploughing (ten to eleven inches) in black or deep soils for destroying deep rooted perennial weeds. It is also suitable for preparing land for sugarcane. It is particularly an ideal plough for ploughing under green manure crops. It requires eight to ten bullocks to draw in black soil. It will plough an acre of land in about two days.

The C. T. 1 is a turnwrest plough ploughing about seven to eight inches deep and requires four bullocks. It will plough an acre in about two days.

The rest are lighter general purpose ploughs cutting about five to six inches deep and are specially suitable for lighter soils. They require two bullocks each. The Sardar is a landside plough. The rest are turnwrest ploughs.

B—Harrows

		Price. Rs.	Sold by
1.	Disc harrow ...	160-170	Macbeth Bros., Bombay.

Remarks.—There are two types: reversible and non-reversible. These harrows are useful for clod crushing specially soon after the plough. The former is useful for preparing ridges after the land has been ploughed and well prepared. Both are useful for intercultivation of cotton grown in the new the ridge method. These are also useful for thoroughly mixing manures with the soil as also for stirring and mulching soils

after harvest so as to make ploughing easier. In the Goradu types of soils as obtained in northern Gujarat these disc harrows do very good deep stirring of the soil and can thus replace the local wooden ploughs. These will work two to three acres in a day.

C—Ridging Ploughs

	Price. Rs.	Sold by
1. P. & O. 10 inches Middle Buster.	69	Macbeth Bros., Bombay.
2. Chatanooga No. 19, Middle Breaker.	56	Macbeth Bros., Bombay.

These are specially made with two mould boards or wings one on each side with special curves so that clean well-laid ridges can be formed. The provision of mould boards on both sides enables the work to be done in half the time which ordinary ploughs would take.

Of the above No. 1 is heavier and is specially suitable for the new method (on ridges five feet apart) of cotton cultivation on the black soils of Surat. No. 2 is suitable for medium black soils.

D—Cultivators

	Price. Rs.	Sold by
1. McCormic Tooth Cultivator.	27½	Macbeth Bros., Bombay.

Remarks.—These cultivators are very efficient for stirring and mulching surface soil between lines of cotton, jowar and garden crops and thus preserving moisture. They are adjustable for different widths from one and a half to two and a half feet. Each of these can be worked by one bullock, and can cultivate from two to three acres a day.

E—Harvesting and Threshing Implements

	Price. Rs.	Sold by
1. McCormic Mower ...	376	Macbeth Bros., Bombay.
2. 3½ Feet New Little Verticle Lift Mower (with ox attachment).	342	Macbeth Bros., Bombay.
3. Knife & Tool Grinder (for the Mower)	23	Macbeth Bros., Bombay.
4. Wheat Thresher (Olpad Type).	75	Through the Government Farm, Surat.
5. Stone Roller for Threshing Jowar	35-40	Could be made locally.

Remarks.—Nos. 1 and 2 are specially advocated for cutting grass in the large grass lands in Chikhli, Bulsar and Pardi Talukas of Surat District and similar situations. These are also suitable for wheat and similar thin-stemmed crops. The land should be free from stumps, pits, &c. These implements can be drawn by two to four strong and fast walking bullocks, and cut from four to five acres a day. These are specially suitable for well-to-do big farmers or co-operative societies.

No. 3 is an essential machine and does the knife sharpening quickly and efficiently.

The Wheat Thresher has 12 steel discs set in a frame in three lines and does very quick and clean threshing of wheat. It can be worked by two bullocks. The cost of threshing with this implement is about 30 per cent. of the usual cost by bullock treading.

The Stone Roller is very efficient for threshing Jowar. This is just like a road roller but smaller in size. It does the work very much quicker, cleaner and cheaper than the usual bullock-treading method. Two, bullocks can work it, thus relieving other cattle for other farm work. It can thresh the produce from five to six acres in a day.

F—Water Lifts, &c.

		Price. Rs.	Sold by
1.	The Bulsar Rahat (all iron).	150-300	Mr. Dahyabhai Chotubhai of Bulsar.
2.	Iron Mhots (35-55 gallons)	22-26	Bhide & Sons, Sangli.
3.	Malhar Mhots (do.)	20-24	Kirloskar Bros., Kirloskarwadi.
4.	Frictionless Pulley for Mhots.	12	

Remarks.—The Bulsar Rahat is entirely made of iron and is useful for lifts between ten feet to thirty feet giving a steady flow of water. This is far better than a Mhot. These require one to two pairs of buffaloes or bullocks according to the depth of water.

The Iron Mhots (self-delivery) do the work as quickly as the leather Mhots do and last twice as long.

The Frictionless Pulley has roller bearings which very largely reduce the friction and thus the oxen find it very much easier than the ordinary wooden pulleys.

G—Other Implements

		Rs.
Levellers (American) (3 and 5 Cft.)	...	30-35

Remarks.—These are very convenient for transporting soil from one place to another for land levelling. These are worked by one pair of bullocks. As against the local levellers, the soil is not dropped on the way except where it is needed. This is a very great improvement over the local levellers or the head-load method.

Note—(1) Prices are liable to fluctuate.

(2) These implements can be obtained through—

(*a*) The nearest Government Farm,

(*b*) The Agricultural Overseer of the District, or

(*c*) The Deputy Director of Agriculture, N. D., Surat.

PRINTED AT THE YERAVDA PRISON PRESS. POONA.

Department of Agriculture, Bombay

LEAFLET No. 2 OF 1927

List of Implements recommended by the Department for the Konkan Division (Ratnagiri, Kolaba, Thana and Kanara Districts)

A—Ploughs

		Price. Rs.	Sold by
1.	Meston Plough ...	10	Burn & Co., Calcutta.
2.	Sabul Plough ...	65	Duncan Stratton & Co., Bombay.
3.	Konkan Plough ...	8	Kirlsoskar Bros., Kirloskarwadi.

Remarks.—The Meston and Konkan are light ploughs easily drawn by two Konkan oxen. They do better work than the wooden ploughs.

The Sabul Plough is very efficient for preparing soils for sugarcane as also for earthing the crop up (with a tail sheet added) when planted 4-5 feet apart. It requires four good bullocks and in Konkan soils ploughs about five to six inches deep.

B—Harrows

		Price. Rs.	Sold by
1.	Deccan Blade Harrow ...	10	Can be prepared locally or through any Government Farm.
2.	Improved Rice Land Puddler.	9	Government Farm, Kumta.

Remarks.—These *harrows* have been found to be very useful for puddling in rice fields (after one or two ploughings have been given) and do the work much more quickly than ploughs alone as is done now. *The improved rice land puddler* is also quite a good implement for making an excellent puddle.

C—Cultivators

		Price. Rs.	Sold by
1.	Tooth Cultivator (Manjri Farm Type).	15-20	Can be got prepared through any Government Farm.
2.	Planet Jr. Handhoe ...	30-40	(1) Clubwala & Co., Fort, Bombay. (2) Messrs. Rowntree Mackenzie & Co., Sholapur Road, Poona.
3.	The "Norcross" Hoe ...	3-12	Limaye Bros., Bombay.
4.	The "Sugras" Hoe (a set of three sizes).	12	Kirloskar Bros., Ltd., Kirloskarwadi.

Remarks.—The Tooth Cultivator is a very good implement for stirring surface soil thus helping to preserve soil moisture. Specially useful in garden crops like chillies, brinjals, sugarcane, &c.

The Planet Junior Hand Hoes are either single wheeled (for smaller widths) or two wheeled (for bigger widths). Spares such as weeding blades, cultivator teeth, furrowers, rakes, &c., are attachable. One man or woman can work about half to three quarters of an acre per day. These hand hoes are specially useful when and where bullocks cannot be worked for inter cultivation.

The "Norcross and Sugras" are hand rakes specially suitable for stirring soils in rings round fruit trees, &c.

D—Other Appliances

(1) *Sugarcane Crushers.*

		Price. Rs.	Sold by
(a)	Chatanooga No. 12 ...	150	Marshall Sons & Co. Bombay.
(b)	Chatanooga No. 23 ...	248	Do. do.
(c)	Kisan ...	200	Kirloskar Bros., Kirloskarwadi.

(2) *Water-lifts.*

		Price. Rs.	Sold by
1.	Bulsar Rahat ...	150-350	Mr. Dayabhai Chhotabhai, of Bulsar.
2.	"Jaldeo" Rahat ...	150-300	Shirgaonkar Iron Works, Belgaum.
3.	Gul Boiling Pans (Poona type).	55-60	Can be got prepared through any Government Farm
4.	American Levellers (Iron) (3 Cft.).	30-35	(1) Rowntree Mackenzie & Co., Poona. (2) Sahasrabuddhe & Co., Poona.

Remarks.— The Iron Sugarcane Crushers extract a much larger quantity of juice (8-10 per cent.) than the wooden ones. All except No. 23 are suitable for two good he-buffaloes while No. 23 is worked by two pairs of buffaloes.

The Water-lifts are both similar in general construction but the "Jaldeo" has no cast-iron parts like the Bulsar. Both these give a steady and a large flow of water and as such are of very great use for sugarcane, cocoanut and other gardening. They require one to two pairs of buffaloes according to the depth of water.

The Poona Gul-pans are a great improvement over the local deep pans. They do the work more quickly and give a better quality of gul and at the same time require less fuel.

The American Levellers are very convenient for transporting soil from one place to another and with a pair of buffaloes do much quicker work than local levellers. As against local levellers, the soil is not dropped on the way except where it is needed. These are strong and durable.

Note—

(1) Prices are liable to fluctuate.

(2) These implements can be obtained through—

(*a*) The nearest Government Farm,

(*b*) The Agricultural Overseer of the District, or

(*c*) The Deputy Director of Agriculture, Ratnagiri.

PRINTED AT THE YERAVDA PRISON PRESS, POONA.

Department of Agriculture, Bombay

LEAFLET No. 3 OF 1927

List of Implements recommended by the Department for Sind

A—Ploughs

Name.	Price.	Sold by
	Rs.	
1. The Sarkar ...	9	Central Agricultural Depot, Mirpurkhas *or* Village carpenters at Mirpurkhas, Jamesabad, Sukkur, Larkana and Ghotki
2. The Meston ...	11	Central Agricultural Depot, Mirpurkhas *or* Village carpenters at Jamesabad, Ghotki and Larkana.
3. The Chatanooga No. 32 ...	28	Messrs. Spedding & Co., Lahore *or* Messrs. Macbeth Bros., Bombay.
4. The Sirdar ...	22	Messrs. Kirloskar Bros. of Kirloskarwadi, Satara. *or* Central Agricultural Depot, Mirpurkhas.

Remarks.—(1) *The Sarkar* essentially a wooden plough fitted with a long beam and broad steel share, is a general purpose plough suitable for all classes of Sind soils, is drawn by a pair of oxen, and turns out one acre in a day of 8 hours. Steel share lasts longer than locally made iron share. A lighter type of this plough is also made for use with small bullocks. It uproots grass and weeds, *viz.*, (erogrostis) "Dub", (Cyperus rotundus) "Kal", and can be used in dry lands in North Sind.

(2) *The Meston* is lightest of iron ploughs, fitted with a long wooden beam, one handle and mouldboard. It slightly inverts the soil, works in dry land of moderate stiffness, but more usefully after irrigation, is suitable for all classes of soil, turns out one acre in a day of 8 hours, 4 to 5 inches deep, and is drawn by a pair of bullocks.

(3) *The Chatanooga* No. 32 is a mouldboard plough fitted with a small wooden beam, two handles and chilled steel mouldboard and share. It is durable and strong, is drawn by a pair of bullocks, penetrates 4 to 6 inches or more deep according to adjustment, inverts soil completely, turns out 30 gunthas to one acre per day of 8 hours, erradicates weeds and buries trash, stubbles and manure. It is suitable for North Sind "Bosi" (unirrigated wheat) tract especially, but works effectively in dry land and paddy stubbles and in all soils after irrigation all over Sind.

(4) *The Sirdar* plough is an imitation of Rajah plough of Oliver Co. of United States of America. It is useful as No. 3 (above). Its parts are made of cast iron which are liable to break and being coarse grained it does not produce a clear furrow.

B—Harrows

Name.	Price.	Sold by
	Rs.	
1. Disc Harrow ...	160	Messrs. Macbeth Bros., Bombay *or* Spedding & Co., Lahore.
2. Nicholson (self-cleaning Roller).	400	Messrs. W. N. Nicholson & Sons, Neward on Trent, England.
3. Cambridge Roller ...	150	Messrs. Howards & Co. of Bedford, England.

Remarks.—(1) *Disc Harrow* consists of 6 concave steel Discs attached to a frame to which a long wooden pole is fitted, useful for crushing clods, pulverising top soil, breaking crust in stiff soils and mixing manure. Also useful for secondary operations in wheat tract, is drawn by a pair of oxen, and turns out two acres in a day.

(2) *Nicholson Roller* consists of 29 two feet diameter cast iron rings fitted to 6 feet long axle which revolves in bearings fitted to the frame. 14 rings are notched with a larger central bore and 15 are fluted with normal bore. Notched rings being loose on the shaft hammer clods to powder and have self-cleaning action. The draft pole is 6 feet long. It is a good clod crusher but does not spoil surface much, and is a packer by closing air pockets in the soil, provides excellent seed bed for germination and growth of seedlings. It is drawn by two pairs of bullocks and finishes 4 acres in a day of 8 hours. It is suitable for the "Bosi" tract of North Sind.

(3) *Cambridge Roller* consists of 16 inch diameter notched rings fitted on an axle, enclosed in the frame. It is provided with a pole for draft. It is a good clod crusher in stiff soils, is suitable for Lower Sind, one strong pair can work it, but ordinarily two pairs will be required. Four acres can be rolled in a day.

C—Levellers

Name.	Price. Rs.	Sold by
1. Wooden Scraper	... 12	Central Agricultural Depot, Mirpurkhas.
2. "Lohi Keen" (Iron leveller).	22	

Remarks.—(1) The *wooden leveller* is useful in levelling land and raising "bunds" around fields. The speed of work is more with this implement than with local leveller. Four pairs with scrapers followed by a plough will finish levelling of and raising "bunds" around an acre in a day of 8 hours.

(2) *Lohi Keen* is an iron leveller which is equal in efficiency to the wooden scraper, but is more durable and strong.

D—Seed drills

Name.	Price. Rs.	Sold by
1. Three coultered Rabi Drill	16	Agricultural College Farm, Lyallpur. Also made locally.
2. The Hoosier Drill	... 500	Messrs. Macbeth Bros., Bombay.

Remarks.—(1) The *Three coultered Rabi Drill* is entirely made of wood, very simple, but economical, sows 3 acres in a a day with one pair only; seed is sown in rows 9 inches apart.

(2) The *Hoosier Drill* consists of a box fitted with 6 to 12 external force-feed-fluted-sliding rollers at the bottom which drop seed in the steel tubes attached round the openings. The steel tubes communicate with the Disc hoes, consequently the seed is deposited in furrow opened by the Disc. Machine is mounted on wheels and hence is easily transported and fitted with a pole drawn by a pair of oxen.

It is a wheat drilling machine; 6 to 7 acres are sown in a day by a pair of bullocks. The distance between the rows is adjustable. Seed dropping is also regulated, as also the depth of sowing. Useful for wheat tracts, especially North Sind.

E—Other Implements

	Name.	Price.	Sold by
		Rs.	
1.	Norag Thresher ...	60	Central Agricultural Depot, Mirpurkhas.
2.	Cane Crushers (Herman's Chattanooga Mill).	200	B. R. Herman & Mohatta, Ltd., Karachi.
3.	Water lifts—		
	(a) Hand Archimedian Screw.	35	Central Agricultural Depot, Mirpurkhas, and Larkana and Sukkur Farms.
	(b) Bullock Power Archimedian Screw.	280	Central Agricultural Depot, Mirpurkhas, and Larkana and Sukkur Farms.
4.	Sukkur Gul Pan ...	40	Government Farm, Sukkur.
5.	Hand Saw Gin ...	450	Messrs. Marshall Sons & Co, Bombay.
6.	Chaff Cutter H. T. B. ...	110	R. Hunt & Co, Earls Colve, England, and T Cossur & Co., Karachi.

Remarks.—(1) Norag Thresher consists of 3 rows of revolving discs fitted to an angle iron frame. It does better, cleaner and quicker work with wheat, with one pair of bullocks than what 6 to 8 heads of oxen can do by treading. It is worked round a heap of the unthreshed wheat which is spread below the thresher. It is suitable for small holdings in wheat tract.

(2) Chattanooga Cane Crusher of Herman & Mohatta, Ltd., consists of 3 heavy rollers having vertical slots and has strong toothed gear wheels on top. Bearing of rollers are adjustable and removable. Rollers are adjusted by one inch studs, the frame is made of angle iron. Crushes 5 times more cane with 75 per cent. less cost and about 60 per cent. of juice is extracted against 45 to 49 per cent. with local ghani. This crusher has proved to be more durable and efficient than others of the similar makes.

(3) (*a*) Hand Archimedian Screw consists of a screw enclosed in a wooden cylinder, is worked by one man, raises as much water as "Hurals" (Persian wheels); suited for 1½ to 2 feet lift only. It is useful in rice tracts where seedlings are raised by lifting water temporarily when early water is low. It is also useful when water level falls during inundation season and has proved to be the stand-by of the cultivator in rice tract.

(*b*) The Bullock Power Screw is the larger size of the above and is fitted with gears to be worked by oxen or donkeys. It is suitable for lifts up to 3 feet only, its capacity is equal to

4 "Hurlas" (Persian wheels), is durable and economical. It is suitable for lift lands, where water is within 3 feet from the surface.

(4) Sukkur Gul Pan resembles Poona Pan and prepares a better quality "Gul" and more quickly than with local deep pans.

(5) Hand Saw Gin is fitted with 10 circular serated discs which strip the cotton off the seed without injuring the seed. Its output is 30 lbs. of lint per hour. It is economical and durable and is suitable for the long stapled cotton, useful for small holdings and for producing home grown seed.

(6) Chaff Cutter H. T. B. is mounted on strong cast iron frame with legs rigidly braced, so that they stand perfectly steady in work. Rising mouth 9$\frac{3}{8}$ inches by 3$\frac{1}{4}$ inches, cuts three lengths, $\frac{1}{4}$ inch, $\frac{3}{8}$ inch and $\frac{5}{8}$ inch, output 1,800 lbs. of dry chaffed kadbi per day. It is fitted with two knives.

Note—

(1) Prices are liable to fluctuate.

(2) All the implements can be obtained through—

(*a*) The nearest Government Farm.

(*b*) The Agricultural Overseer of the District.

(*c*) The Deputy Director of Agriculture, Sind.

PRINTED AT THE YERAVDA PRISON PRESS, POONA.

Department of Agriculture, Bombay

LEAFLET No. 4 OF 1927

(*Replaces Leaflet No. 2 of 1921*)

Chaff-cutters

Almost all over the Bombay Presidency and especially so in eastern districts, owing to unsatisfactory rains, the supply of sufficient good fodder to cattle has become a problem of very great importance. One of the methods of meeting this difficulty is so to use the present supply as to make it last for a longer time. The present methods of feeding *Jowar Kadbi* and other similar fodders by throwing before the cattle whole bundles, or at most long pieces only, has been after experiments and experience found to be wasteful because the cattle eat only the more leafy and thinner parts of the stalk and thus about twenty-five to forty per cent. of the fodder is thrown out as waste. Continued experiments have proved beyond doubt that if the same fodder is cut into small pieces half to one inch in size and then fed to cattle, the waste is at once reduced to only about five per cent. It will thus be seen that a farmer can save a good deal of his fodder supply by feeding it in small pieces

To cut fodder into small pieces by hand is only possible for a farmer who has only a pair or two of bullocks to feed. But when a larger number of cattle are to be fed *chaff-cutters* have been found to be more suitable and economical in the long run.

The following is list of chaff-cutters of various sizes and prices which are available and have been found to be very useful:—

No.	Name of the chaff-cutter.	Manufacturer or their agents.	Present price.	Approximate output in 8 hours.	Power required.	No of bullocks for which the machine is suitable (at 20 lbs. dry fodder per head per day).
			Rs. a. p.	lbs.		Bullocks.
	A—*Lever Chaff-cutters.*					
1	Kirloskar ...	Kirloskar Bros., Ltd., Kirloskarwadi, District Satara.	18 0 0	150	1 man.	7

No.	Name of the chaff-cutter.	Manufacturer or their agents.	Present price.			Approximate output in 8 hours.	Power required.	No. of bullocks for which the machine is suitable (at 20 lbs. dry fodder per head per day).
			Rs.	a.	p.	lbs.		Bullocks.
	B—*Circular Chaff-cutters.*							
1	Kirloskar ...	Kirloskar Bros., Ltd., Kirloskarwadi, District Satara.	65	0	0	500-650	2 men.	25 to 30
2	Satara ...	Satara Industrial Works, Satara.	65	0	0	500-650	2 men.	25 to 30
3	Macrown ...	Rowntree McKenzie and Co., Sholapur Road, Poona.	...			400-500	2 men.	20 to 25
4	Richmond and Chandler, A. A. Type.	Macbeth Bros., Ltd., Bombay.	75	0	0	600-800	2 men.	30 to 40
5	Ohio Pony 8½" (2 Knives).	N. H. Patuk & Co., Grant Road, Bombay.	165	0	0	500-600	2 men.	25 to 30
6	R. Hunt's Atlas E (3 Knives).	B. R. Herman & Co., Karachi.	500	0	0	2,000 (human power)	7 men.	100
						6,000 (engine power 3 B.H.P.)	2 men and 1 boy.	300
7	R. Hunt's H. P. B. No. D-40	Do. ...	125	0	0	1,200	2 men and 1 boy.	60
8	Rajah ...	Volkart Bros., Karachi.	108	0	0	1,200	2 men and 1 boy.	60
9	R. Hunt's Atlas A.	B. R. Herman & Co., Karachi.	125	0	0	1,200	2 men and 1 boy.	60

Remarks

The Kirloskar lever chaff-cutter is suitable only for small farmers. The knife is to be worked by lifting and pressing down on the fodder, sharply and strongly. After each cut the fodder is required to be pushed forward under the knife for a second cut.

In all the other cutters, the fodder is automatically pushed forward under the knives. With the exception of No. 6 which has three knives, all the other circular cutters have two knives. No. 6 is suitable for engine or bullock gear power while the rest are worked by hand. So also No. 6 is suitable for farmers owning a large number of cattle or for bigger co-operative concerns, while the remaining cutters are suited for individual farmers or smaller co-operative societies.

The prices are liable to fluctuate.

The machines may be ordered direct from the agents or through—

(*a*) The nearest Government Farm,

(*b*) The nearest Agricultural Overseer; or

(*c*) The Deputy Director of Agriculture,

(1) Surat for Gujarat.

(2) Nasik for Khandesh and Nasik.

(3) Poona for Poona, Satara, Sholapur and Ahmednagar.

(4) Dharwar for Belgaum, Dharwar and Bijapur.

PRINTED AT THE YERAVDA PRISON PRESS, POONA.

Department of Agriculture, Bombay

LEAFLET No. 5 OF 1927

(Replaces Leaflet No. 3 of 1909)

A Practical System of Storing Farmyard Manure

The most important and valuable manure for crops in this, as in every country, consists of the dung and other excreta of animals, particularly, in Western India, of cattle and goats. The value of this material can be very greatly increased by care in storage, and the object of the present leaflet is to show how this can be done.

At present usually little care is taken. They are generally heaped up in a loose irregular manner either near the cattle shed or outside the village, exposed to sun and rain. In the Konkan, the usual method is to store cattle manure in pits specially prepared or in holes in the rocks. In North Gujarat, some cultivators take great care of cattle manure and store it in pits in fairly compact and uniform layers, most of the urine being daily well mixed with the dung before removal to the pit while the remainder is absorbed by the bedding of earth or straw, which is itself occasionally removed to the manure pit.

Common defects of storing manure.—The usual careless methods of storing cattle manure lead to very great losses. The richest part of animal excreta, as manure, consists of the urine, and this is very often not collected at all, but is simply allowed to run away and is lost. Further, when a heap of cattle manure is exposed to rain, so that the water draining through the heap can run away, a very great loss is sustained, and the greater part of the value of the manure is lost. Again when cattle manure is kept in a loose heap, exposed to air, it becomes dry and a good deal of its manurial value disappears.

Method recommended for storing farmyard manure.—To avoid these losses, and to make the best use of the limited amount of manure available the following method is recommended.

A pit should be dug large enough to hold the manure of the cattle from the holding between two planting seasons. This should not be more than four feet deep. The site of such a pit should not be in a hollow where rain water is likely to collect. Where possible, the pit should have a bottom through which water cannot easily drain, and this may be secured by natural hard *murum* where this occurs, or by a layer of concrete, four inches deep at the bottom. Failing the latter, a layer of soil or vegetable refuse, a foot deep, may be placed at the bottom of the pit. This will serve to absorb the drainage from the manure itself. The sides of the pit should be sloping, and should be hardened by ramming.

A manure pit, ten feet square, and four to six feet deep, will take the excreta from a pair of bullocks and a buffalo. This need not be covered, unless the rainfall is very heavy or the temperature very high during much of the year.

The urine may be led to the pit from the cattle shed where this is possible. Under ordinary conditions, it is not possible, however, and then it should be kept by providing bedding for the cattle which will absorb such liquid excreta. The bedding may consist of straw, though this is usually too valuable as fodder in Western India to be used for the purpose. In its absence the bedding may be made of groundnut husk, rice husk, waste fodder, dry leaves, or even of loose earth.

The dung should be removed from the cattle shed to the manure pit daily, and the bedding used for absorbing the urine should be also taken to the manure pit at frequent intervals. The portion put into the pit each day, should be pressed down and well compacted, so as to form part of the layer already there. This method of filling the pit, and using the urine will, as a rule, keep the manure moist. Under extreme conditions, it may be necessary to sprinkle the material in the pit with water to keep it moist. When the pit is full the manure well rotted in the pit should either be taken to the fields and incorporated with the soil, or else a new pit should be made and filled in a similar fashion. When such a pit is emptied, the upper unrotted portions should be placed on one side, and only the rotted material used as manure. The unrotted part should be again put into the pit and form the basis of its next filling with cattle dung and urine as before.

PRINTED AT THE YERAVDA PRISON PRESS, POONA.

Department of Agriculture, Bombay

LEAFLET No. 6 OF 1927

Control of the Powdery Mildew of Grape

Powdery mildew, locally known as *bhuri*, has long been recognized as the most destructive and widespread disease of grape vine in the Bombay Presidency. It causes considerable damage every year to vines not properly treated, resulting in a heavy reduction in yield. In consequence, as a result of certain experiments carried out in this Presidency, the Bombay Department of Agriculture issued Leaflet No. 3 of 1912, recommending the practice of spraying the vines with Bordeaux mixture at certain intervals of time.

Though this method has checked the mildew, a more satisfactory treatment has now been discovered, by dusting the vines with sulphur.

Dusting with sulphur is generally recognized as a specific remedy for all powdery mildews, including the one of grape. Experiments made in the year 1926-27 in the Deccan have now conclusively shown that the application of sulphur on mildewed vines is much superior to that of Bordeaux mixture, in effecting the control of the disease, in improving the quality of fruit, and in cheapness.

Symptoms.—This disease is too well known to grape growers to require a detailed description. However, it may be stated that it may attack any above-ground part of the vine-leaves, shoots, blossoms and fruits.

On leaves.—It appears at first as whitish patches, which ultimately turn grayish white.

On shoots.—The fungus also attacks the young shoots or canes. Usually it is confined to patches; but in cases of severe attack, the whole surface may be involved.

On blossoms.—Affected blossoms fail to set their fruit.

On fruits.—If young berries are affected, they may drop off. If attacked when half grown, the berries become irregular in form. If severally attacked they may crack, thus reducing their value for market purposes. Slightly affected berries may ripen without cracking, but they are disfigured by spots.

B 1783

Remedy.—The best remedy for this disease is the application of pure finely powdered sulphur (flowers of sulphur). The value of sulphur as a preventive of grape vine mildew is determined chiefly by its fineness. Given the proper condition, the finer the particles, the greater is the rapidity with which the effect takes place.

Where to get sulphur.—Any of the larger chemical firms in Bombay can supply sulphur. The price fluctuates but at the time of issue of this leaflet is about Rs. 8 per cwt. retail, and Rs. 150 per ton wholesale.

How to apply sulphur.—The best method of applying sulphur is by means of an efficient duster. The dusting machine, known as "Torpille" Machine, was used in this investigation. It is manufactured by Wm. Weeks & Son, Ltd., Maidstone, England, and can be purchased from Messrs. Rowntree McKenzie & Co., Ltd., Sholapur Road, Poona. It costs about Rs. 28. The chief drawback of this machine is its inability to regulate the discharge of sulphur, thus resulting in the waste of the material. There is, however, an efficient dusting machine on the market, and is known as the Savage Duster. This duster is geared very high, so that slow cranking will give the desired distribution of sulphur. When it is empty, it weighs about 10 pounds, and the hopper will carry about 9 pounds of sulphur. It can also be adjusted to discharge from one pound to twenty pounds of sulphur per acre. This duster, which is manufactured by Messrs. D. B. Smith and Company, Utica, N. Y., U. S. A., can be obtained from Mr. H. V. Gole, Nasik City, who has undertaken to supply this machine to growers at Nasik or in any other part of the Presidency. If, however, there is any difficulty in obtaining it, it is requested that enquiries should be addressed to the Plant Pathologist to Government, Bombay Presidency, Poona. The cost price of this duster will amount to about Rs. 50.

When to apply sulphur.—The number of times it is necessary to apply sulphur will depend mainly on three factors: season, locality and the sources of infection.

In the Deccan, the following schedule of sulphuring is recommended:—

(1) The first application should be given at the time when the new shoots are not more than six to eight inches long. The first sulphuring is by far the most important and should be done *very thoroughly.* The

aim of this application is to prevent infection of the young tender shoots and leaves which, at this stage, are very frequently attacked.

(2) The second application should be given when the blossoms begin to open or just before blossoming.

(3) The third sulphuring should be done about one and a half months after the second application. This time the vines should be lightly dusted and the quantity of sulphur applied should not be more than half of that used in the second application.

(4) If the first and second applications have been thoroughly given and if there is no danger of reinfection from untreated vines the fourth application will *not* be necessary. However, if there is a need for it, it may be given about one month after the third application and should be as light as the latter.

It should be borne in mind that after any application it will be necessary to resulphur if three to four days of bright sunshine have not intervened before the sulphur was removed by rain. It should also be repeated that the aim of sulphuring should be to cover every exposed surface of the vine. *No vine, at any account, should be left untreated in a vineyard.*

Time of the day to apply sulphur.—Sulphur may be applied at any time of the day, provided there is not much wind nor excessive moisture in the air.

Dry moderately warm weather and still days are the best.

Cost of sulphuring.—It is not yet possible to compare the cost of sulphuring and spraying with Bordeaux mixture an acre under grapes. However, experiments at Modibag and Ganeshkhind Gardens, Poona, point to the conclusion that dusting with sulphur is a much cheaper and more economical method of treating the vines.

Sulphur and Bordeaux mixture treatments compared

Sulphur treatment	*Bordeaux mixture treatment*
(1) If properly applied, it controls the disease most effectively.	(1) It has not been able to effect a complete control under any conditions.
(2) Cheaper than Bordeaux mixture treatment.	(2) Costs more than sulphur treatment.
(3) Causes no scorching on the leaves.	(3) Under certain conditions, Bordeaux mixture causes severe burning of the leaves.
(4) Improves the quality of fruit.	(4) No such advantage can be claimed for Bordeaux mixture. On the other hand, the berries are stained by this treatment.
(5) Requires no preparation.	(5) The preparation of Bordeaux mixture is a rather tedious, messy business.
(6) Requires no water.	(6) Requires water and big barrels for preparation.
(7) Sulphur can be stored indefinitely.	(7) Cannot be stored indefinitely.
(8) Sulphur can be applied in a short time during critical periods and uncertain weather conditions.	(8) It is not the case with Bordeaux mixture treatment.
(9) It is much easier to apply and is a labour-saving treatment.	(9) Not so here.
(10) Requires a dusting machine which gives little trouble.	(10) Requires a spray pump which is apt to give trouble.

PRINTED AT THE YERAVDA PRISON PRESS, POONA.

Department of Agriculture, Bombay

LEAFLET No. 13 OF 1926

(*to replace Leaflet No. 5 of 1914*)

Remedies for Koleroga Disease of Betelnuts.

The Kanara district claims an area of 18,000 acres of betelnut gardens with an annual production of crops worth Rs. 40 to 50 lacs. These gardens are damaged from a long time by a disease called "Koleroga" which affects the bunches of betelnut palms dropping the nuts and thus causing heavy loss to the gardeners. The damage by *koleroga* can be estimated on an average from 15 to 25 per cent of the yield. Taking the average normal yield at 2½ *khandies* (1 *khandi* = 560 lbs) per acre priced at Rs. 350 this loss works at Rs. 50 to 75. There are certain gardens and years in which the damage is much more. A very modest estimate of the annual toll of loss by *koleroga* disease can be calculated at 8 to 10 lacs of rupees in the whole of the Kanara district.

The appearance of the disease during the rainy season has induced the belief that it is caused by rain. As a matter of fact the rains play an important part in the origin and spread of disease by bringing about favourable moist conditions of weather. The real cause of the disease is a minute parasitic plant belonging to the group of fungi.

The fungi or minute plants make their living on dead or living organisms, plants or animals; what are known as moulds and mushrooms are familiar examples of fungi. Those which live on dead organisms are called "Saprophytes" and those which live on living ones are called "Parasites". The fungus causing *koleroga* disease is hence called a "Parasite". A very familiar example of a parasitic plant, though not a fungus is seen in the Loranthus (Bandgul in Marathi; Bandarike in Kanarese) on mango and other trees; the parasite feeds and draws its nourishment from its host gradually sapping the vitality and producing a diseased condition. Similarly, this fungus which causes *koleroga* feeds on the growing parts of the betelnuts and being minute and spreading in very large numbers in a short time, causes the nuts to fall with loss in yield.

The disease usually begins about the end of June or beginning of July, when there is plenty of moisture in the air. The first signs of disease are given by the dropping of nuts from the diseased bunches. Such fallen nuts are found to have lost their natural green colour and are usually covered with a soft white mould. This whitish mass can be scraped off with a knife or even with one's fingers' nails. This is known as "Bhusargole" or "white *koleroga*". In some cases the nuts do not show any mould but are found to have part of their surface darker green in colour at the base of the nut, like the appearance of being water soaked. This is known as "Nirgole". If such nuts are kept in moist atmosphere for a day or two, the whitish substances develop gradually and cover all over. In other words, "Nirgole" is only the early stage of "Bhusragole".

If a little bit of this white substance be scraped off with a needle and examined under the microscope in a drop of water it will be seen to consist of innumerable whitish threads (Fig. 1 in plate 1) closely interwoven branching in every direction. These threads are the body of the parasitic plant which live in and on the betelnut, sucking up food from it and killing it, so that it falls down as to rot. Such white threads will be found breaking out from inside the nut, which in a day or two intertwine themselves with threads from similar patches, so that the whole surface of the nut is covered up. On examining carefully these minute threads on the surface of the diseased nuts, these are found here and there, often in large numbers, as small oval or round bodies (Fig. 2, plate 1) which are the fruiting bodies of the fungus. These are called "Sporangia" and the process of their formation takes not more than four hours. These bodies when mature liberate seeds which are called "Spores". The small bodies (sporangia) contain 10 to 40 such spores (Fig. 2 (2), plate 1). After they swim about in a drop of water for a period of 20 minutes to one hour, they come to rest and begin to sprout by throwing out fine threads (Fig. 2 (3), plate 1). If, however, these threads do not find suitable nourishment they would die. These spores are so minute that thousands of them are found in one drop of rain water. On the surface of the betelnut are minute openings called "Breathing pores". These cannot be seen by the naked eye but are large enough to allow thousands of spores to enter. These spores are carried away by wind in rain drops on to the healthy fresh bunches of nuts, where they readily germinate

and start fresh centres of attack spreading in the direction of the winds. In this way it takes only a couple of days to a week for the disease to find full swing to play when once a garden becomes affected.

Besides these spores which are responsible for the spread of the disease during the rains, there are other spores fitted for resisting drought. These are almost round and the living substance is coated by a thick wall to enable them to resist drying out. These spores are slightly bigger than above. In an affected garden large number of spores may remain dormant until the following monsoons, when just like paddy seeds they sprout out and begin to grow Thus the disease spreads from gardens to gardens and from year to year continuing the damages all over the garden areas.

Remedies adopted by the people.—The gardeners from time immemorial are in the habit of tying *kottes* or hoods to the betelnut bunches. *Kottes* are coverings made out of basal sheaths ot betel leaves, over the bunches to prevent rains from getting in. The idea seems to have started from the belief that the disease is brought about by rains These coverings help to prevent entrance of water on to the bunches during the rainy season which is a favourable condition for the growth of spores and spread of the disease, as explained above, in the life history of the *koleroga* fungus; and the method is useful only to the extent of preventing first the contamination with and then the spread of these spores and this would occur only when the *kotte* tying is done at the right time, *i.e.*, before the disease has made its appearance. *Kotte* tying does not help much when the fungus spores have once attacked the bunches. The supply of *kotte* material to cover all bunches in a garden is found short, since all the leaf sheaths cannot be saved, those in the monsoons getting rotten. Again, the heavy winds of July and consequent striking of trees one against another cause some of the *kottes* to drop down. Besides, the operation has to be done during the heavy down-pours of rain when the trees are slippery; and only expert labour can manage it. The *kotte* tying to be effective should be earlier before the fungus is spread by winds and rains; but this in fact cannot be managed for practical difficulties: (1) Bunches would be small and their hoods would have to be small too to fit so that they might not drop down. Such small hoods in their expansion of the bunches would burst out. (2) The hoods would be longer liable to

be damaged by rotting and blown out by heavy winds. In spite of the customary operation which has become a routine for the gardeners, the damage by *koleroga* disease is not minimised as effectively and adequately as desirable.

The new spraying remedy.—Since we know that the white mould is the real cause, anything that will kill the fungus will give us a means for combating the disease. Such a thing is the Bordeaux mixture. This mixture is applied to the bunches on the top of trees by means of a machine called a sprayer. The materials for preparing the mixture are the following which are commonly found in the bazar:—

Copper sulphate.

Unslaked lime.

Resin.

Soda.

The mixture is prepared as under:—

I. (A) Dissolve 5 lbs. of copper sulphate in 12 gallons of water.

(B) Slake 5 lbs. of lime in 12 gallons of water.

II. Heat 2 lbs. of resin and 1 lb. of soda in 1 gallon of water till clear. This is added to give the mixture greater sticking power so as not to be washed off by the rains. Some care is necessary to see that the boiling is done properly; the mixture should constantly be stirred so as not to boil over. When complete, the sticky mixture forms a string just like treacle. This process would require about one hour.

The solution (B) is poured into (A) by constantly stirring and then the mixture II is added slowly stirring with a thick stick or laddle but not of iron material, until the whole forms a completely well dissolved solution. This is best done by pouring 3-4 times from vessel to vessel. The mixture should be prepared in the earthen, wooden or copper vessel but in no case in an iron one. When complete, the mixture gives a bright blue colour with a sticky froth. The mixture should be tested by plunging a clean knife blade for a minute or two into it. If a red deposit should appear on the blade, more lime should be added until the colouration disappears. For whatever the quantity of mixture prepared, the proportion of material used should be always correct. Since the mixture is to be used fresh, the quantity required for the day's work only should be prepared each time.

This solution takes about half an hour to dry when sprayed on the bunches and once dried can usually last till the harvest. This mixture is called "Resin-soda Bordeaux mixture".

Another mixture recently recommended by the Mysore Agricultural Department is called "Casein Bordeaux mixture" which is prepared as under:—

I. (A) Dissolve 5 lbs. of copper sulphate in 12 gallons of water.

(B) Slake 5 lbs. of lime in 12 gallons of water.

These two are to be mixed up as in the above.

II. (A) Dissolve ½ lb. of casein in ½ gallon of water.

(B) Slake ½ lb. of lime in ½ gallon of water.

Pour solution II (A) slowly in II (B) stirring constantly until the mixture is completely incorporated. This would take about ten minutes. This mixture has to be added to the Bordeaux mixture I, already prepared and thoroughly mixed up. The solution would give a light blue colouration but with less froth or stud unlike the resin-soda mixture. This kind of mixture is easy for preparation and with the least trouble can be done in the gardens only. This has been experimented with largely in Mysore and has been found to be equally effective requiring about ½ an hour to dry just like the resin-soda mixture. This is recommended for early spraying in May since it forms a thin film of rather pale colour on the betelnuts as compared to the resin-soda mixture which being more sticky has one advantage that it can stand spraying even during small drizzles. Hence the casein mixture has to be used on more clear days free from showers. This mixture costs about a rupee less per acre than the other kind.

The mixture is applied by means of an appliance called sprayer; the one most suitable for *koleroga* spraying is the compressed air type having a copper vessel with a capacity of 1 gallon, *i.e.*, 10 lbs. (Fig. 3, plate 1). The mixture should be poured ⅔ full. The air is compressed by means of a pump provided in the sprayer itself, so that the compressed air forces a solution in the form of a fine mist. The sprayers are tied to the back (Fig. 4, plate 1) of the operator who climbs the trees and sprays the bunches. One charge of the sprayer is sufficient for 10 to 12 trees. The following table gives the quantity of materials generally sufficient for the numbers of trees mentioned therein.

Table of requirements of spraying materials for 75 to 600 trees.

No. of trees.	Copper Sulphate (tolas)	Water. (gallon)	Lime. (tolas)	Water. (gallon)	Resin. (tolas)	Soda. tolas)	Water. lbs.	Remarks.
75	50	3	50	3	20	10	2½	One gallon = 10 lbs; one lb. = 40 tolas.
150	100	6	100	6	40	20	5	
300	200	12	200	12	80	40	10	
450	300	18	300	18	120	60	15	
600	400	24	400	24	160	80	20	

The quantities can thus be worked for any required number of trees.

Care should be taken that the bunches receive the spray all over. When slight drippings are seen to fall, it may be considered that the spraying is sufficiently done. This Operation is very much simple compared to *kotte* tying.

The spraying is to be done just before the rains, *i.e.*, the end of May or the beginning of June forms the most opportune time. The season commences from the 3rd week of May when the nuts develop to the requisite size, and lasts till about the middle of July, the work being done, during the breaks which occur intermittently. About 15 to 20 days of break in all can be depended on during this period of spraying season. One man can spray 100 to 150 trees per day of 4 to 6 hours of break and thus in one season 3 to 5 acres can be managed with one sprayer. Hence it is necessary that every gardener should purchase his own sprayer. Generally spraying once is sufficient to control the disease. But if on account of unusual rains favouring the disease or of carelessness in spraying on the part of the climber, the nuts would be seen to drop, a second spraying may be necessary. A few of the surrounding trees where the diseased nuts are found, should also receive the treatment.

Cost of spraying.—The cost of spraying materials comes to Rs. 5 to 6 per acre. Five days of one climber would be required for one acre taking 100 trees per man per day.

Fig. 1 आकृति १

आकृति २ Fig. 2

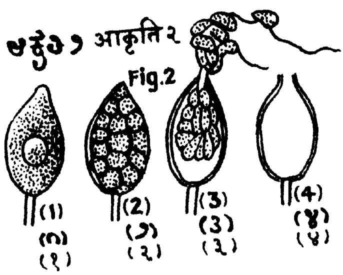


Fig. 4. आकृति ४

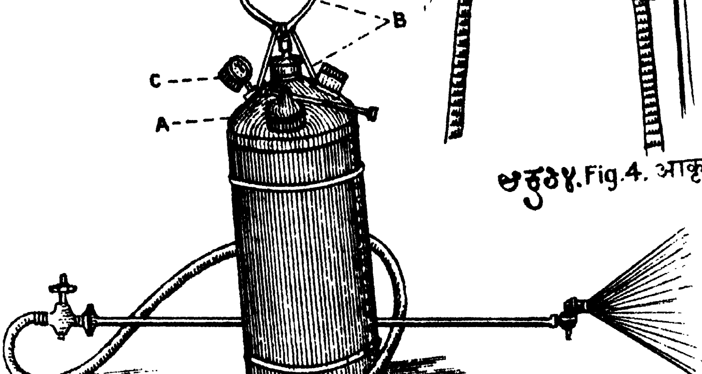


Fig. 3. आकृति ३

Even if the wages are fixed on contract rates for the number of trees sprayed as in *kotte* tying, say at Rs. 2 per 100 trees, the wages would come to Rs. 10 per acre. According to the supply and demand of labour, this cost may vary. The gardeners have actually to spend for *kotte* tying more than Rs. 20 out of pocket and hence the cost of spraying operation can be estimated to be within the limits they spend at present.

The price of a sprayer is only Rs. 25 which is not required to be spent every year as the sprayers can last for 10 to 12 years.

Comparison between *kotte* tying and spraying :—

Kotte tying.	Spraying with Bordeaux Mixture.
(1) The *kotte* tying method protects the betelnut bunches from external weather conditions and thus controls the spread of diseased spores if done properly and timely. The *kottes* get damaged by heavy rains and storms later in the season. The *kotte* materials are also found to be insufficient to supply whole of the gardens.	(1) The spraying remedy not only kills the mildew that might have already appeared on the nut, but also prevents the ingress of the diseased spores to germinate on the nut and thus completely checks the disease.
(2) *Kotte* tying to be effective should be done early before the bunches are affected by disease, but this is not practically possible. The diseased nuts remain enclosed within the hoods which become the source for further spread of disease.	(2) The bunches being always open the nuts affected before spraying have the scope for dropping down, thus removing the cause of contamination.
(3) *Kotte* tying not being possible earlier, has to be done later during the heavy rains and winds, and the operations are more risky, requiring expert climbers.	(3) Spraying can be done early in June when the rains are not yet as heavy and continuous as later on, and ordinary climbers can pick up the work. The gardeners themselves can manage the operations if they would, as in Mysore.

(4) One man can manage about 20 trees or 50 to 60 bunches for *kotte* tying per hour. An expert climber is able to tie the *kottes* (hoods) for 150 to 200 bunches, *i.e.*, 60 to 75 trees as an average day's work. (There are 3 bunches normally per tree.)

The work being more taxing, the climbers would require greater intervals for rest.

(4) One man can easily spray 40 to 50 trees per hour with a clear break and is able to manage 150 trees, *i.e*, 350 to 400 bunches as an average day's work. In spite of small showers in the middle, it is possible to spray 100 trees as the minimum number;

The spraying is less taxing of physical exertions.

(5) The whole process of *kotte* tying operations costs not less than Rs. 15 to 20 per acre to the gardeners out of pocket, apart from routine work managed by the family for collection of *kotte* materials and other preparations. The contract wages of *kotte* tying varies from Rs. 12 to 20 according to the supply and demand for climbers.

(5) The cost of spraying material is only Rs. 5 to 6 per acre; and the wages of 5 days of a climber at 100 trees per day would not exceed the limit of *kotte* tying expenses.

(6) *Kotte* tying can be done even during the heavy rains.

(6) Spraying should not be done during the rains except under slight drizzles at intervals of a long break.

(7) *Kotte* tying on account of their being torn in time and other defects mentioned above, is if at all only partially effective.

(7) Spraying done properly and timely is thoroughly effective.

It will thus be found that spraying is decidedly more effective and profitable in the end, though at present the need of a break in the rains may present some difficulty in the economical employment of wage labour. As the gardeners would shoulder the problem themselves in course of time, this may be easier to manage and organise.

Thus a very large percentage of loss can be averted by the introduction of spraying remedies wholesale all over the

garden area. In fact the spraying remedy can be made as effective a routine operation as the usual *kotte* tying, the latter becoming only a supplementary one, if at all required under any circumstances.

Special points to be particularly attended to in the spraying operations are as under:—

(1) The ingredients required for Bordeaux mixture should be used in right proportions, *vide* table No. 1. In no way the proportion of copper sulphate should be higher than that of lime.

(2) The mixture should be carefully prepared according to the foregoing instructions and used afresh every day. It should not be used after 12 hours.

(3) The lime should be used as quick lime unslaked and quite fresh. It should be stocked in close tins and not exposed to moist weather.

(4) The sprayers should be cleaned after use every day; and the climbers should thoroughly understand the handling of the machine.

(5) The operation should not be done during heavy rains. Very light drizzles in the middle would not do harm in case of resin-soda Bordeaux mixture. Half an hour of clear break is required for the mixture of medicine to dry on the bunches.

(6) The mixture forms a bright bluish white colouration on the nuts when dried; and it is necessary to see that all parts of the bunch receive the spray. If by any chance as sudden down pours of rains, bad working, &c., the nuts begin to drop down from the sprayed bunches, re-spraying would be necessary. A few surrounding trees should be sprayed soon after.

(7) The spraying should be taken at the right stage of the nuts, *i.e.*, when the nuts come out of their cups with green colour. Earlier spraying would leave subsequently developed portions of nuts exposed to infection of spores.

There are certain false notions formed that the spraying adversly affects the betel vines, pepper, and other plants and the betelnut trees are damaged in course of years. These notions are entirely unfounded. The experiences of the vast operations carried out in Mysore for the last 15 years have given a lie to any form of such belief to be formed. The area of gardens sprayed is extending there by leaps and bounds,

as much as over six thousand acres being controlled by this remedy in 1925. For the last three years this is extending in Kanara, Honavar, Sirsi, and Siddapur talukas.

For further extension the Agricultural Department has provided the following organisations to help the gardeners:—

(1) There would be trained local *Kamgars* for small areas which could be effectively manageable by each, to popularise spraying, distributing materials, and train the people in preparing the mixture and other works.

(2) Depots would be opened at convenient centres where sprayers and spraying materials would be stocked for sale.

(3) Training classes for climbers and gardeners and magic lantern shows will be arranged where necessary.

(4) Co-operative societies or *tagai* loans from the Revenue Department where the former do not exist, can supply the necessary finance if wanted.

(5) There would be one fieldman for each taluka to guide, supervise, and direct the *Kamgars* or to help the gardeners directly as much as possible.

Directions for the Use of Sprayers for Koleroga Spraying.

It has been already stated in the foregoing part that the Bordeaux mixture has to be applied by means of an instrument called a sprayer.

2. The sprayer found most suitable uptill now is one called "Holders Automatic Pekrun Sprayers" manufactured by Messrs. Gebrauder Holder Implement Factory, Mitzingen, Germany. The sprayers are of various sizes; but anything of above one gallon capacity is found to be too heavy to be carried on the back of men climbing the betelnut trees to reach the bunches of nuts. A size of one gallon capacity should only, therefore, be used.

3. The sprayer consists of the following parts:—

(1) Copper tank or vessel, (2) Air pump, (3) A screw-cover, (4) Tube-connection, (5) Air pressure gauge or metre, (6) Canvas or rubber tubing, (7) Brass tubing with stop-cock, (8) Spray nozzles.

The vessel is made of copper or brass 12″ high and 6½″ diameter, the copper one being preferable as it is more lasting than other metal and can be repaired or soldered easily. There is a cover at A (*see* illustration) which is screwed into the opening or the mouth of the vessel, through which the mixture is poured in. One gallon of Bordeaux mixture would fill about ⅔ of the vessel and this is done by means of a funnel with fine wire gauze, supplied with the machine to prevent any solid particles or dirt entering in the vessel as to clog the mouth of tubings. After filling, the cover is to be screwed tight. Just in the middle there is an air pump by which the air is then pumped in until the pointer on metre has passed to the red mark on the dial which indicates that sufficient air has been forced in. It is not desirable to force in more air beyond this limit, lest the vessel may burst. If the air pressed is less than the red mark, it is not enough to force the fluid (spraying mixture) freely in fine spray through the nozzles. Hence it should be seen that neither too much nor too little air is forced in, before starting work. This can be obtained by pumping for 15 to 20 times only. In order to set the sprayers for work, the stop-cock at the end of the brass tube is turned straight; and the compressed air forces the mixture out at the opening of the end piece of brass tube which is called nozzle. The brass tube to which the spray nozzle is attached is 18″ long and has an arrangement of single wire

gauze tubing of 8″ to further prevent any small foreign matter from clogging the nozzle end. The nozzle is so constructed that the mixture is forced out as fine mist spreading over 3 feet in circumference. The cap at the end piece D can be replaced by others as to give very fine or coarser mist. With the help of a nozzle for long distance, the mixture can be sprayed 15 to 20 feet high, and this is being used while spraying the small trees from the ground level itself, and the high topped bunches out of reach in the ordinary course of climbing. The small nozzle gives a much finer spray like mist or dew and this is commonly used for getting good results.

4. The sprayer is provided with an attachment for lifting up by means of a jute or plantain fibre strap and can be taken on the back or tied to the waist. The Kanara garden climber has all the necessary paraphernalia with him for climbing the trees and needs no instructions. An improvised pulley fixed to the tree may be more useful for raising up or lowering the sprayer from the tree top. It is better to keep the nozzle to the distance of 2-3 feet from the bunches, so that the spray covers all over the nuts. The use of the long nozzle is recommended only when the bunch-fruits of trees cannot be reached; in this the spray is coarse and some of the mixture is wasted.

5. *Care and up-keep of sprayers.*—The tank or the vessel and all the spare parts of the sprayer, should be thoroughly washed at the end of the day's work. The screw cover should be opened and filling in half a gallon of water, it should be washed once or twice. Next, filling the vessel with water, nearly half the air should be forced in by means of the air pump and the water let out through the tubing to remove the dirty particles and spray-mixture remaining inside.

At the end of the season, the sprayer should be washed and cleaned thoroughly dry and kept in a safe place. The nozzle parts which are likely to be lost should be screwed tight, thoroughly cleaned and covered with vaseline or oil and kept in safe custody. The straps and leather washers are to be protected against rats. With these precautions, the sprayers can be expected to last for 10 to 12 years.

6. *Occasional repairs.*—The spare parts are to be screwed on to the sprayers to their proper attachments. These should be tightened or loosened properly and with care; otherwise they are liable to be damaged or lost. No parts are to be fixed *without leather washers* which may

require to be oiled or covered with vaseline occasionally. If lost, these should be replaced immediately:

(1) *Clogging the mouth of nozzle.*—The opening is likely to be clogged with dirt particles or lime; and this should be removed with needle point.

(2) *Defect in getting fine spray.*—This may be due to low air compression. The pump should be used till the pointer reads the red mark on the metre. The leather washers should be replaced by fresh ones or when they get stiff and dry, oiling freely would prevent the trouble.

(3) *Care of rubber and canvas tubes.*—Sometimes, these tubes are found to leak which may be due to the inner lining getting rotten. This should be cut down to the rotten point; if found too short, it may be replaced by a new tube. The tube should be fixed to the connection properly by means of copper wire properly tightened. After the work the tube should be disconnected and cleaned and kept hanging to dry. Bending and twisting would spoil the tube. Under proper care, these can last for 3-4 years.

(4) *Leakages of the vessel.*—The vessel is made air-tight by means of screw caps which are inlaid with leather washers. These should be carefully handled; washers, replaced or oiled occasionally. Any leakages by striking against trees or falling down from a height should be stopped by soldering the parts; the local tin smith can do it. Any small repairs can be learnt by the gardeners by experience. It is not possible to get leather washers prepared to the exact size in the villages. The leather is not tanned properly and becomes stiff. It is recommended to have a spare set of washers always ready at hand.

7. *Precautions for climbers in handling sprayers.*—The gardeners should have complete knowledge of the various uses of all spare parts and should train the climbers in handling them properly. They can manage to set right any small defect in getting good work on the trees only, without wasting time. The tightening and loosening of nozzle parts and cover screws is most important.

8. The climbers should be careful to see that all the nuts on the bunches receive the spray mixture and that mixture is not wasted by careless handling. Some climbers,

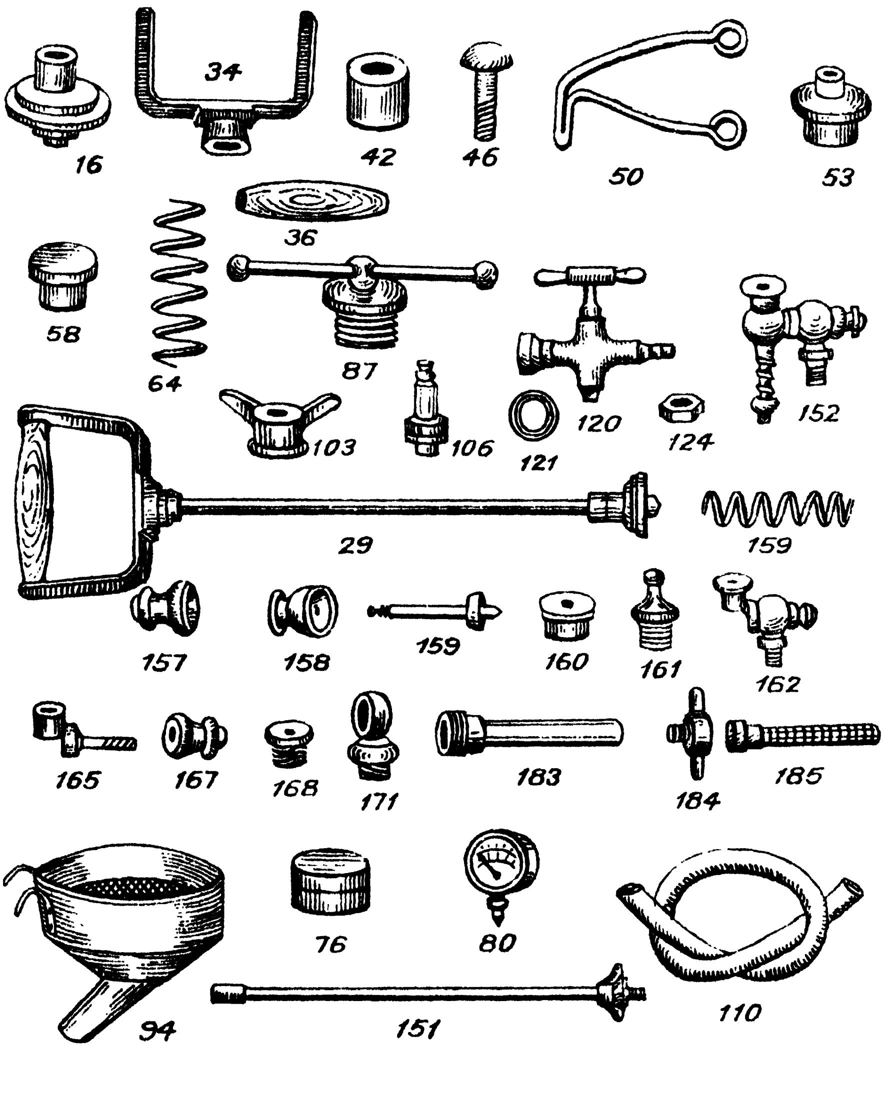
in order to do the work quickly, may make use of long nozzle to spray; this should be avoided as the spray is coarse. While lifting the sprayers up and down the trees, the sprayers should not strike against them and get damaged or jammed. The nozzle or the caps are likely to be lost if kept loose. It is, therefore, necessary that the owner should supervise the work carefully and engage good men. All the good results of spraying depend on careful spraying and any neglect on the part of climbers would produce adverse effects.

9. *Spare parts to be stocked by gardeners.*—

(1) Canvas tubes, (2) Nozzle and caps, (3) Leather washers, (4) Spanner, (5) Copper wire and vaseline.

The enclosed cut illustrates all the parts of the sprayer with their numbers, names and present prices.

PRINTED AT THE YERAVDA PRISON PRESS, POONA.


16
34
42
46
50
53
36
58
64
87
120
152
103
106
121
124
29
159
157
158
159
160
161
162
165
167
168
171
183
184
185
94
76
80
151
110

THE POONA
AGRICULTURAL COLLEGE MAGAZINE.

VOL. XIX.] SEPTEMBER 1927. [No. 2.

EDITORIALS.

Nature is very frolicsome and always takes great delight in its vagaries. It is over bountiful at one place, whereas it is over-miserly at another. It is certainly a very rare and fortunate circumstance that it casts a smiling look. This year, at any rate Gujerat and Sind seem to be the victims of the vagaries of Nature which is having its play to its hearts contents.

* * * *

For the last month or so the precipitation had been extremely heavy and continuous in Gujerat as a result of which all the rivers were in immense floods and the tract being naturally flat and level, water began to rise and spread all over the country. The cities, towns and villages were all innudated, and many places were actually swept away by the forcible currents of water.

* * * *

Description would but beggar, indeed, to give an adequate idea of the havoc wrought by the floods. As soon as water began to rise and enter the houses, people began to run for life from place to place leaving behind all the movable and immoveable property. Many climbed trees and had to remain there for days together without food in incessant danger of the trees being broken and washed away. Houses collapsed, big trees uprooted, railway lines demolished, telegraphic posts broken down, every where chaos, horror and ghastliness !!

* * * *

All communications being cut off and being completely isolated from the world many had to meet a watery grave. Though the loss of human life has not been exactly estimated yet it must be considerable, but the loss of life other than human must be immense. This was the condition of cities. The helpless condition of the rural areas must be simply appalling as there was no possibility of help from outside. Till last week or a fortnight reports

were being heard about some villages being still cut off and sorrounded by water and aeroplanes were being engaged to reach some help to these areas.

* * * *

The whole of the Presidency has been astir and resounding with the feeling of sympathy which is being expressed through out the length and breadth and from every corner. The gravity of the situation being made known and realised, Relief measures are being started every where. Government and the people have been doing their utmost to relieve the situation.

* * * *

Our College on its part convened a meeting consisting of the members of the staff and the students and passed a resolution of sympathy for the sufferers. A strong committee of Professors and students has been appointed for collecting subscription from the staff and the students, which will be then forwarded to the proper authorities for the flood relief. We would hereby take this opportunity to request all to contribute their mite to this benevolent purpose.

* * * *

The report of the Bombay Presidency Agricultural Show held at Poona last October has been recently published. It gives briefly the account of the show from its very inception to its finish as to how the idea of holding such a big show originated, how it was planned and organised and how it was successfully brought to a close. From the statements given in the report it will be seen that about two lakhs of persons visited the show during the period of 12 days. About Rs. 2,19,188-10 was the gross expenditure, while the total receipts amounted to Rs. 2,26,310-4-6. Under facts, and Impressions have been given opinions expressed by Distinguished visitors to the Show notably among them being the members of the Royal Commission on Agriculture. At the end of the report are given the Lessons to be learnt from this Show, which we think will be of immense use as a guide to the conveners of the future shows.

* * * *

The next show in the series to be convened at Ahmedabad will not—it is heard if circumstances do not permit—be held owing to the recent calamity which has befallen the whole of Gujarat and Kathiawar. The floods have devastated the country side and the cultivators and the rural areas are extremely hard hit; so when the mental peace has been so rudely shaken, no body will be surprised if the show is postponed a year later and the money collected for the show is utilised in bringing relief to the sufferers.

DIVERSIFICATION OF FARMING ON THE DECCAN CANALS.

BY

V. V. GADGIL, B. Ag.

(*Ag. Dirl. Supt. of Agri. Dc.*)

In the Deccan, the Nira and Mutha Canals are the oldest and and have got the history of the past 30 years. The Mutha Canal was completed in 1896 and the Nira Canal in 1898. The Godavari Canals were completed in 1895 while the new Pravara Canals have commenced irrigation from 1921.

The area irrigated by each of these canals is as follows;—

		Sugarcane		*Other crops.*	
		About	Acres.	About	Acres.
1,	Mutha Canal.	,,	3500	,,	13500
2.	Nira Left Bank Canal.	,,	6500	,,	67000
3.	Godavari Canals.	,,	7500	,,	42000
4.	Pravara Canals.	,,	10000	,,	45000

Any casual visitor on these canals will mark that the whole energy of the cultivators has been concentrated in sugarcane crop which requires an annual investment of more than 2 crores of rupees. But what is the present condition of the sugarcane industry? Before the Great War the prices of Gul were moderate (Rs. 12 to 15 per Palla) but then the cost of living was very cheap, labour was adequate and wages were very low; the prices of manure and oil-cakes were also moderate and hence sugarcane cultivation could lay by sufficient profits in those days. During the War, the supply of foreign sugar was very limited and the rates were very high. Naturally therefore the prices of Gul were abnormally increased and in one year (1919) the Gul was sold at Rs. 90/-per Palla. This was the most favourable opportunity to develop the sugarcane cultivation inspite of the high cost of labour and manure and every cultivator on the canals tried to put up maximum area under sugarcane. A good many cultivators had seized this opportunity and made thousands of rupees. The writer knows several instances in which the net profits of sugarcane exceeded Rs. 2500

per acre. But since the close of the war, the Western countries began to pour cheap sugar into India and the prospects of sugarcane began to decline. For some time the Gul Market tried to keep up its turn and this fact can be observed from the relative prices of Gul and Sugar in 1924; when Gul was sold at Rs. 38 per Palla and sugar at Rs. 30 per Palla. But how long can this industry compete with the cheap sugar of Beet and cane of the western countries? We know that the sugarcane area in India is limited and the merchants can post the Gul market. But it is very doubtful whether people can afford to purchase Gul at a costly rate when cheap sugars are close at their doors. It is a well known fact that the Government have imposed protection duty on the imported sugar but still foreign countries are competing in the supply of Indian sugar. Further it should be considered that the planters, who are experts in producing cheap sugar in Java and Mauritius, can easily prepare cheap Gul to compete with the Indian stuff. In the last season a trial of the imported Gul seems to have been made in India but the stuff was very inferior and could not stand in comparison with the fine Gul of the Deccan Canals. But a lesson should be taken from such incidents and the sugar growers should be always on their guard.

Let us now consider the factors with which the Deccan sugarcane planter has to fight for his industry.

(1) The competition of cheap sugar and Gul. This has been already dealt with above.

(2) The next point is the condition of labour on the Canal tract. Since the Great war the wages have been increased by 200 p.c. and although the price of food grains and other commodities are now decreased, there is not much reduction in the wages. 10 year's back the daily wages of the labour varied from annas 4 to 6 but at present he demands 10 to 12 annas. The period of work is also shortened by 2 hours a day and his efficiency is decreased. As a result even half the work is not turned out by paying double wages. The present tendency of the labouring class is to take up the work by contracts but the quality of the work is very inferior and hence contracts are given only for earthing up of cane, harvest and manufacture of Gul. The labour question will assume a serious term when the movement of labour unions is spreading rapidly.

(3) The third point is the high prices of farm yard manure and oil-cakes. Before 1910 farm yard manure was very cheap and there was less demand for oil-cakes. But since the cultivation of sugarcane is extended on a large scale, farm yard manure has

become insufficient and one gunny bag of cowdung is sold at annas 12. Some substitutes like san green manuring, burying Pachat etc. have been found in recent years but they are not generally used as people are under the impression that farm yard manure is more effective in improving the physical condition of the soil. The oil-cakes are largely used for sugarcane and there is no chance of reducing their price. The heavy cost of manuring will therefore always hang over the heads of cane growers.

(4) The fourth point is the question of large capital required for sugarcane crop. As stated above the sugarcane crop on the Deccan Canals requires more than two crores of rupees and poor cultivators are always at the mercy of the Sawkars (money lenders) or Banks as they have to pay high rate of interest and are required to accept oil-cakes and other manures at a costly rate from the Sawkars or merchants. From the rough data of the Nira Canals it has been observed that about 30 lacks of rupees are advanced as loans to the cane growers of 6000 acres. The Cooperative Societies are trying to solve this difficulty but their supply is far below the demand and as a result the indebtedness is gradually increasing. It is a common belief of the people of the Nira Canals that since the advent of the Canal the rich men have become still richer while the middle class of agriculturists have become bankrupt. Capital therefore plays a very important part in the sugarcane industry.

(5) The fifth point is the enhancement of water rates on sugarcane by 50 p. c. It is not the object of this article to discuss whether the enhancement is justified or not but the water rates are likely to increase when the investment on canals fetches a very low rate of interest. Further the sugarcane grower has to face the difficulty in timely watering and other minor troubles of the irrigation subordinates.

(6) Sixth point is the condition of the soil required for sugarcane crop which is a most important factor. The soil of the Nira Canal appears to be somewhat exhausted as the 1st and 2nd ratoon crops could not be successfully taken in this tract. The Pravara and Godavari tracts are fertile at present but the land is likely to suffer from water-logging and salt incrustation and such cases are bound to occur when the question of drainage is not solved.

(7) The next point is the rent of the land which is steadily increasing on the Godavari canal. The rent has been increased recently from Rs. 15 to 35 per acre.

(8) The same land cannot be cropped up with sugarcane continuously and some economic rotation is necessary.

(9) The prices of Gul are fluctuating and no body knows whether there are any chances of rise in price, cultivation and out-turn. This is a very contested point, as the average cost of cultivation varies from Rs. 800 to 1200 according to the different statements and different localities and the average outturn also varies from 28 Pallas to 40 Pallas of Gul per acre. But taking a mean of the statements it may be remarked that an outturn of 34 Pallas of Gul may cost Rs. 1000 and the cost per Palla may come to Rs. 29-7-0. This statement is even misleading as in the recent conference it was found out that a sugarcane planter is in a position to pay Rs. 45 as water tax per acre if the price of Gul be Rs. 96 per Palla.

When all the above points are taken into consideration it is very difficult to say how much margin of net profit a cultivator is likely to derive from the sugarcane cultivation? In the normal year of prices and outturn, it has been ascertained the average profit of sugarcane varies from Rs. 100 to 125 per acre with the greatest trouble of cultivation throughout the whole year and if unforeseen difficulties such as the attack of borers, low prices of Gul etc. do not come in the way. The cultivator can hardly make the two ends meet. This is the present position of sugarcane industry on the Deccan Canals. People are pursuing this business only on the hope of better prospects and if the prices of Gul will fall down, the sugarcane cultivation is sure to receive a set back. Is it not therefore advisable to divert the attention of cultivators to some other crops which would be equally paying to them? Before proceeding further I may clearly state here that I am not dissuading the cultivators from going in for sugarcane but on the contrary I would insist that they should extend its cultivation to the utmost limit by adopting labour saving economy in cultivation and the introduction of more profitable varieties. My main-object in writing this article is to bring to the notice of the Irrigators the possibility of the diversified farming on the Deccan Canals, so that they should not repent for neglecting other crops in case the sugarcane cultivation becomes unprofitable. A beginning in this direction has been made by the Agricultural Department since the last 2 years. But people are still reluctant to follow the advice. Let us now consider what are the prospects of other kinds of farming on the Canals. Uptil now the tendency of the farmer is to take sugarcane in as many years as possible and the rotation is generally based on this principle. On the Nira Canal sugarcane is rotated with Bajri or Jowar and some times with local Groundnut and Wheat. But none of these crops are sufficiently lucrative

and only keep the cultivator engaged throughout the whole year. On the Godavari and Pravara Canals sugarcane crop stands at least 3 years on the same land and afterwards it is rotated with Bajri, Jowar or Wheat and again the land is prepared for sugarcane. Since the introduction of block system the area under sugarcane is limited to ⅓ of the block and the people are naturally required to pay attention to Bhusar crops. To impress the necessity of such crops the Department is trying to introduce the following crops (1) Cotton (2) Big Japan and Spanish Ground-nut (3) Turmeric (4) Potatoes (5) Fruit trees-chiefly Grapes, Figs and Oranges. Let us consider the economic value of each of this crop.

(1) *Cotton* :—Two varieties of Cotton were tried on the Nira Canals viz. 1, N. R. Cotton from Khandesh and 2, Upland variety of Dharwar American from Gadag. These were grown for the last two years and it was found out that the Upland Cotton does not suit this tract as it is badly affected by Red-leaf-blight and yields comparatively low. The N. R. Cotton is the more suitable type for this tract and the yields are beyond expectations. If the crop is sown about the middle of May, the maximum yield received is 2000 lbs. per acre. But the average yield received by the cultivators vary from 1200 to 1500 lbs. The chief point to be observed in this cultivation is (1) the early sowing (middle of May) (2) selection of pure N. R. seed (3) timely interculturing and weeding and (4) clean picking. If the Cotton crop be taken on sugarcane land, there is no necessity of additional manuring as the land has got residual effect of manure. But in other cases, it is advisable to manure the land with 10 to 15 cart loads of farm yard manure and if necessary th crop may be topdressed with castor cake. The total cost of cultivation is about Rs. 90 per acre while taking the lowest price of Cotton viz. Rs. 30 per palla of 940 lbs. of Kapas, the value of outturn of 1200 lbs. would be Rs. 165 thus leaving a margin of profit of Rs. 75 per acre. This fact has been very well impressed on the minds of the Nira Canal Irrigators and the Cotton cultivation is spreading very rapidly in this tract. Last year the area under Cotton was about 8000 acres while in the current year it has exceeded 5000 acres on the Nira Canal. The capital required for this cultivation is very small and the crop is harvested within 6 months and the farmer can take another crop like Wheat or Gram after the crop is harvested. This will be one of the best rotations for sugarcane. But people on the Pravara and Godavari Canals have not paid proper attention to it. I must point out one important point in this cultivation viz. the necessity of early sowing. If the crop

is sown late in June or July, the yield is very much reduced and the chances of profit are less. This point has been neglected by many cultivators and as a result they are not much impressed with Cotton. I would request the cultivators to see the standing N. R. Cotton crop of the following places in this season so that they will get the idea about the prospects of Cotton crop.

1. Baramati. Mr. Shembekar's crop 2. Vadgaon. Mr. Sathe's crop 3. Hol. Mr. Unde's crop 4. Bavda. Mr. Bajirao Patil's crop.	Nira Canal.

There are many good plots on the Nira Canal but I need not give the details.

1. Loni Irrigation Bunglow compound 2. Musalwadi ,, 3. Khandala ,, 4. Vadala ,,	Pravara Canal
1. Padhegaon Irrigation Bunglow 2. Ranjangaon ,,	Godavari Canal

It is presumed that Cotton will play a prominent part on the canals as the canal Cotton is far superior in staple and class to that of Khandesh Cotton and fetches better price. It is usually classed as fine Umbra Cotton in Bombay. There is a far wider scope for the extension of Cotton cultivation on the Pravara and the Nira Right Bank Canals and people should think over taking to this crop seriously.

(2) *Ground-nut*:—Uptil now local Groundnut is sown on the Deccan Canals. Only in some places Big Japan Groundnut has been introduced but it is a deteriorated variety and does not produce better yield. Local variety is sown with the object of selling green pods but there is no groundnut market in any part of the canals. In Satara District, Big Japan is taken as a dry crop in thousands of acres and very good yields varying from 2500 to 3000 lbs. of pods per acre received. If this variety be introduced on the Deccan tracts, it will be one of the principal sources of income. The cost of cultivation of Ground-nut is about Rs. 100 per acre while the value of outturn is about Rs. 150. Recently some cultivators commenced to grow this variety but the progress is very slow. This variety ripens earlier than the local one and is worth introducing.

Another variety worthy of attention is the Spanish Peanut which is the earliest variety and ripens within 3 ⅓ months. This can be successfully taken on light lands which are not included in

blocks. The most important point to be observed in this cultivation is the proper seed rate viz. 80 to 100 lbs. of kernels per acre. This variety does not spread like the above one and hence close sowing is essential. The cost of cultivation is Rs. 60 to 70 per acre while the value of outturn is about Rs. 125 per acre. There is no trouble of digging this groundnut as all the pods are easily uprooted along with the plants. The yield per acre is 2000 lbs. of pods. As this variety is harvested within 4 months, any rabi crop can be taken after this. In Khandesh this variety has been proved most profitable and the area under this variety has been increased from 20000 to 300000 acres during the last 12 years. Every possible attention should, therefore, be paid to the extension of Groundnut on the Deccan Canals.

(3) *Turmeric*:—This is a crop which has received great importance in the Southern Maratha Country. After the close of the Great War the price of Turmeric was extremely high and its cultivation was most profitable but since last year the price has again gone down and there is not sufficient margin of profit left in its cultivation. But as Turmeric is a commodity of every day requirement there is every chance of the revival of the prices. The best crop yields up to 30000 lbs. of cured Turmeric and the new method of broad ridge system experimented at the Agricultural College Farm is worth adopting on the canal tracts. The well-to-do cultivator should try to preserve the seed in expectation of better prespects. I do not wish to give more details of this crop on account of its depressed market value.

(4) *Fruit trees*:—This has got a wider scope on all the canals but sufficient attention has not been paid to this subject. The importance of Orange and Mosambis is well known to the cultivators of Rahuri Taluka which is the home of this fruit. But the Irrigators of the Deccan Canals have not tried to extend it as they prefer to plant cane. One of the reason for this neglect is that the tenants (Saswad Malis) have got no interest in the land after the lease is over and that the owners of the land are in want of funds and the requisite knowledge required for this purpose. The Orange plantation, once established, brings about 800 rupees per acre and the cost of cultivation would not exceed Rs. 1500. The extension of these fruit trees is therefore more profitable than the sugarcane cultivation. The Orange plantation requires rich and well drained soil and on the canal tracts medium and lighter soils are more common. What are the suitable fruit trees for such lands? In the Modi Garden (Poona) you will see that Grapes, Figs and Pomegranates are successfully

taken on murum lands and this fact should be specially observed by the Bagaitdars on the Nira and Pravara Canals. There is a vast area of lighter lands which can be converted into fruit gardens and it will be a permanent income to the planters. Some special knowledge is required to make these plantations successful but Agricultural Department is ready to help them in the matter. A few gardens of Grapes and Oranges have been recently started on the Canals and the success of this enterprise is sure to make a good effect on the irrigators. On the Nira Canal. the gardens of Messrs. Uplekar and Date will serve as object lesson plots. The land of Mr. Uplekar is composed of bare murum and any body will be wonderstruck to see the best crop of Grapes, Guavas and Pomegranates and Figs on this land. Similarly the skill of Mr. G.M. Date of Baramati in acquiring the knowledge of budding, grafting and other technical matters of fruit culture is worth mentioning. In a short period of 2 or 3 years he is in a position to supply young grafts of various fruit trees to moffusil cultivators. On the canals Grape gardens will be seen at Baramati, Malegaon, Vadgaon, Shelgaon and Bavda of the Nira Canal and at Devlali, Vadala, Ashwi, Rahata, Brahmangaon and Padhegaon of the Pravara and Godavari Canals. All the area under these canals has been recently shown to Dr. Chima, the Government Horticulturist and he is of opinion that the Irrigators can convert the so called lands into fine gardens of Figs and Grapes. The land commanded by the Nira Right Bank is more or less undulated and of lighter nature and he thinks that it is more suitable for fruit trees than for the sugarcane crop.

I must express my sincere thanks to the officers of Irrigation Department for giving every possible opportunity to demonstrate the cultivation of the above mentioned crops and fruit trees in the compound of their Irrigation Bangalows. Unless the cultivators actually see the benefit of the crops with their own eyes they will be never impressed with the advantage of growing fruit trees. Most of the Bunglow compounds especially on the Godavari and Pravara Canals now serve as object lesson plots and in the absence of such facilities it would not have been possible to introduce any other crops in a short period.

The attention of the canal Irrigators should also be drawn to the other paying crops which can be successfully introduced in this tract. Such crops include Potatoes, Tobacco, Ginger, Suran etc. which are worth introducing on the Deccan Canals. I need not go into the details of these crops as they have not been systema-

tically tried on the canals but in my opinion these crops are most paying and should be tried by well-to-do cultivators.

Before concluding this article I may again clearly state that the object of this article is not to discourage the sugarcane cultivators but to impress them with the necessity of adopting the diversification of farming on the Deccan Canals, which would ultimately bring prosperity to the untiring cultivators.

DO YOU KEEP RECORDS?

BY

YESHWANTRAO P. BHOSALE.

(*Michigan State College of Agriculture, East Lansing, Michigan, U. S. A.*)

Suppose some one comes to you to-morrow and asks you, "Say, do you keep records of your dairy herd?" Records! Yes records. You stop and look at him, wondering if he is sane. And I don't blame you at all for this. Keeping records is a new thing to the average farmer in India. Keeping records is keeping a check over the production of your dairy cows. Keeping records means watching over the amount of feeds fed and the pounds of milk produced by each cow.

Now some one may question me, "Why keep records? Can't we guess which cow is good and which is bad?" And I may say that he is at perfect liberty to do so but how can he be sure that he is right? A cow that looks pleasing to the eye is not always a good producer. A cow may be beautiful, (and please don't laugh when I use the word beautiful, beautiful because cows have beauty), but she may be the cause of your losing money. If you want to be sure whether a cow is profitable to keep or not you must have facts, cold facts, to back up your decision. And herein records come in.

There may be some of you who still won't believe me, and I don't blame you for one cannot expect everyone to believe what he says. Many an American farmer has told me that the very idea of keeping records was a "Bah". Now I will tell you of two dairymen I know and let you see for yourself.

Here is Mr. X, the owner of the Luckydale Dairy Farms. He is a prosperous dairyman and he believes in keeping records. There are 36 cows in his herd, and 21 of them are in milk any one time. He keeps a close check over the amount of milk produced by each cow and the feed consumed by her. He does not keep a cow that does not produce at least 9,000 pounds of milk in a year. Two

months ago when I visited him he told me that his dairy farm returned him an income of $ 8000, last year.

Now here is Mr. Y, the man who thinks records are a "Bah". He is not prosperous and has hard time making both ends meet. Any cow that looks good must be a good producer, he told me. He was on the verge of bankruptcy when he decided to try keeping records. Two weeks later he found that the cow he thought was best was the poorest individual in the herd and he sold her off. He has now come to the conclusion, "Eyes may deceive you but records won't ".

It is almost impossible to test milk for fat on the average farm in India. But it is possible to weigh the milk that each cow gives, and credit her with that amount daily on the record sheet. Here is an example of a weekly record sheet which will help you in keeping records.

Number of cow.	Figures below show lbs. of milk produced, morning and evening.													
	Sunday		Monday		Tuesday		Wednes day.		Thursday		Friday		Satur day.	
10	30	31	29	30	27	30	30	30	25	26	30	31	28	25
13	42	38	40	40	38	41	43	35	40	28	45	37	39	40

Also keep a similar record of the amount of feed fed to each cow. Such records will help you to find out which cows are profitable and which are not.

Efficiency of milk production depends upon the kind of feeds fed to dairy cows. A ration must be balanced, must supply all the nutrients needed by cows, in order to help a cow to produce as much as she can. Kind of roughage, hay or fodder, fed determines efficiency of production. The nature of grain mixture fed should be determined by the kind of roughage fed. The aim of the grain mixture should be to supply everything that a cow should have and all that a roughage lacks.

Experimental work shows that legumes, such as alfalfa or sweet clover, helps to produce milk economically. Legume hays are rich in protein, and alfalfa contains as much protein as wheat bran. At the same time it is cheaper to feed alfalfa than wheat bran.

Breeding has a lot to do with the amount of milk that a cow is able to produce. If one expect to own a good herd of dairy cows he must use good bulls in his breeding programne. Bulls are half the herd.

STUDIES IN THE CHEMISTRY OF THE SUGARS IN THE FRUITS ESPECIALLY MANGO DURING THE PROCESS OF RIPENING.

(Continued from the last number.)

BY

V. G. PATWARDHAN, M. Sc., M. Ag. .

2. The following is the record of temperature of *Adhi* during the process of ripening. There were three sets of different country varieties arranged for ripening which were kept under examination from day to day. The temperature was recorded every morning at 8 a. m.

	Set No. 1		Set No. 2		Set No. 3	
	Temperature of the room	Temperature of the pile	Temperature of the room	Temperature of the pile	Temperature of the room	Temperature of the pile
1st day of the ripening process	28° C.	28° C.	28° C.	28° C.	28° C.	28° C.
2nd day of the ripening process	28° C.	31° C.	28° C.	32° C.	28° C.	32° C.
3rd day of the ripening process	28° C.	32° C.	28° C.	33° C. 34° C. Lowest layer	28° C.	33° C.
4th day of the ripening process	28° C.	33° C. 34° C. Lowest layer	28° C.	35° C.	28° C.	34° C. 35° C. Lowest layer
5th day of the ripening process	28° C.	35° C. 36° C. Lowest layer	27° C.	35° C.	27° C.	35° C.
6th day of the ripening process	26° C.	36° C. 37° C. Lowest layer	26° C.	35° C.	26° C.	35° C.
7th day of the ripening process	28° C,	36° C. 38° C. Lowest layer	27° C.	36° C.	27° C.	36° C.

On the eighth day the mangoes were removed for the market. From the temperature record it can be seen that as the days proceed, the temperature slowly rises and goes as much as 8 to 10° higher than the room temperature. It has been found that when the temperature goes above 36° C. the mangoes become over-ripe and begin to rot very rapidly. In case of *Alphonso* and *Pairi* mangoes the ripening is generally delayed and hence the temperature is not allowed to go so high. When it goes to about 33° C. or so, that is on the fourth day they are removed from the pile and made to ripen slowly by keeping them on hay in a single layer.

The determinations of moisture, acidity, sugars &c. were done in samples taken every alternate day during the process of ripening from the piles arranged for ripening; and also from some of the samples of other varieties as *Pairi*, *Alphonso* &c.

3. Moisture :—It was determined in the pulp of the fruit.

	Set No.	Set No. 2	Set No. 3
	Moisture in the pulp	Moisture in the pulp	Moisture in the pulp
	p. c.	p. c.	p. c.
First day of the ripening process	79·0	77·4	74·4
Third day of the ripening process	76·1	82·9	82·8
Fifth day of the ripening process	76·2	82·5	81·8
Seventh day of the ripening process	77·6	82·3	86·2
Eighth day of the repening process	76·4	86·9	...

	Sample No. 1	Sample No. 2
	Moisture p. c.	Moisture p. c.
Pulp of *Pad* fruits	80·5	...
Pulp of ripe *Pairi* fruit	79·3	...
Pulp of ripe *Alphonso* fruit	80·5	81·3
Canned *Alphonso* juice	80·5	83·3

The moisture in the pulp of the unripe fruit is always less than the pulp of the ripe fruit. The amount of moisture varies according as the fruit is fibrous or pulpy.

Relation of pulp, skin and stone to fruit:—The following are the figures given as percentage on the whole fruit.

	Set No. 1 p. c.			Set No. 2 p. c.			Set No. 3 p. c.		
	Pulp	Skin	stone	Pulp	Skin	stone	Pulp	Skin	stone
First day of the ripening process	69·4	14·5	16·1	67·9	16·8	15·3	68·4	16·5	15·1
Third day of the ripening process	68·1	13·1	18·8	57·7	21·0	21·3	63·1	15·0	21·9
Fifth day of the ripening process	63·0	17·5	19·5	65·1	15·1	19·8	63·5	13·8	22·7
Seventh day of the ripening process	59·2	13·6	17·4	63·2	18·1	18·7	58·4	16·8	24·8
Eighth day of the ripening process	66·3	15·0	18·7	59·2	20·0	22·8	...	...	...

	Sample No. 1			Sample No. 2		
	Pulp p. c.	skin p. c.	stone p. c.	Pulp p. c.	skin p. c.	stone p. c.
Pad frutits	61·9	20·1	18	...	...	...
Alphonso ripe fruit	62·5	19·5	18	64·6	18·7	16·7
Pairi ripe fruit	48·1	18·3	33·6	...	...	...

These figures do not show any definite relation, but generally the pulp is over 60 p. c. of the total weight of the fruit. There is some reduction in the amount of pulp, probably due to the loss in moisture during ripening.

The changes in the colour, smell, taste and feel during ripening.

	Colour	Smell	Taste	Feel
First day of the ripening process	Green	of raw mango	sour	stiff
Third day of the ripening process	Greenish	Do	less sour	Do
Fifth day of the ripening process	Slightly yellow at the stalk end	of semi ripe mango	not very sour	softening slightly
Seventh day of the ripening process	Entire yellow glowing	of ripe mango	sweetish	soft
Eighth day of the ripening process	Do	Do	sweet	Do

In the beginning the change in the colour, smell and taste is slow but after fourth day it is quite rapid and may be complete within the next two or three days. In some varieties no change in colour is obtained, only it becomes dull green or whitish green, and in some varieties, bright red colour on the exposed shoulder of the fruit at the stalk end with glowing yellow is obtained. Taste and odour differ in different varieties and it can be said to be particular of a particular variety as the charming odour of *Pairi*, and fatty and delicious taste of *Alphonso* are the characteristics of these varieties. Size and shape of the mango fruit vary a great deal. It can weigh from 2 ozs to 1½ lbs. and can vary in size from an egg to a big cocoanut.

4. Changes in the amount of acidity during ripening:—The acidity is determined by titrating the extract with Decinorma caustic potash using phenol-phthalein as an indicator. It is expressed in terms of miligrammes of casutic potash for one gramme of the dry pulp.

	Acidity in terms of milligrams of caustic potash per 1 gram. of day pulp		
	Set No. 1	Set No. 2	Set No. 3
Fisrt day of the ripening process	176·50	150·34	87·07
Third day of the ripening process	122·63	81·60	43·30
Fifth day of the ripening process	103·90	51·70	38·80
Seventh day of the ripening process	44·67	35·02	38·60
Eighth day of the ripening process	22·22	41·80	...

	Acidity in terms of milligrams of caustic potash per 1 gram. of dry pulp.	
	I	II
Pad fruits	140·00	...
Ripe *Pairi* fruit	22·50	...
Ripe Alphonso fruit	48·4	17·54
Canned Alphonso juice	30·3	21·70

From the figures of acidity it can be seen that there is a regular fall in the amount from the early to the last stage, the first two days it is slow, the next three or four days it is very rapid and then it is more or less constant.

The amount of acid present varies with the variety. The acidity may decrease upto even 12 p.c. of the original unripe sample but usually it is 25 to 35 p. c. of the original. The presence of slight acidity in the well ripe fruit gives a better taste to the mango, which is equal to 30 to 40 millgrammes of caustic potash per gramme of dry pulp or juice.

5. Sugars:—Changes in the amount of sugars both reducing and non-reducing during ripening:—Sugars are estimated both as reducing and non-reducing by the method of Fehling's. All the figures are calculated on the dry matter of the pulp. By noting the relation of pulp to fruit, they can be estimated on the whole fruit

	Percentage of sugars on the dry matter of the pulp.								
	Set No. 1			Set No. 2			Set No. 3		
	Reducing sugars	Nonreducing sugars	Total sugars	Reducing sugars	Nonreducing sugars	Totaal sugars	Reducing sugars	Nonreducing sugars	Total sugars
First day of the ripening process	...	...	...	...	11·8	11·8	0·84	37·56	38·4
Third day of the ripening process	0·67	34·51	35·18	2·8	50·58	53·38	2·5	67·73	70·23
5th day of the ripening process	1·68	45·10	46·78	2·0	61·31	63·31	1·66	66·80	68·46
7th day of the ripening process	5·55	42·70	48·25	1·89	76·01	77·90	3·00	66·56	69·56
9th day of the ripening process	1·55	68·43	69 98	2·84	67·00	69·84	...	...	...

	Percentage of sugars on the dry matter of the pulp.					
	Reducing sugars	Non-reducing sugars	Total sugars	Reducing sugars	Non-reducing sugars	Total sugars
	Sample No. 1			Sample No. 2		
Pad fruits	1·22	38·46	40·38			
Ripe pairi fruit	9·0	52·67	61·67			
Ripe Alphonso fruit.	3·66	47·01	50·67	14·48	33·76	48·22
Alphonso canned fruit.	17·95	43·53	61·38	26·76	21·20	48·66

The figures of sugars clearly show that there is sudden increase in the amount in the beginning and then it is gradual. There are reducing sugars present, but they are quite negligible when compared with non-reducing ones. Nonreducing sugars vary from 50 to 65 p. c. while reducing ones from 1 to 5 p. c. only. It is very clear that when the juice is preserved in cans there is very large increase of the reducing sugars owing to the likely inversion taking place of the non-reducing sugars.

Conclusions :—Such are the results which are obtained so far of the preliminary study of the ripening process and the chemical changes with which it is accompanied.

As regards the commercial ripening of the mango fruit it is shown how it is carried out under local conditions, and in some measure the chemical changes by which it is accompanied. It is necessary to make further experiments to find out conditions under which it is most successful, to modify the local practices darkness of the ripening chamber, and ill-ventilation &c. and to improve it to make it quicker and more satisfactory leading to less loss by rotting.

As regard the chemical constituents only sugars and acids are studied. The changes in the amount of sugars and acids are quite rapid, namely increase in the amount of non-reducing sugars and decrease in the amount of acids, during the process of ripening. The study of the complete chemistry of the mango fruit in all its stages is the next problem.

APPENDIX.

To the studies in the chemistry of sugars in Mango.

Chemical composition of some of the important varieties of mangoes and mango juice.

	Ripe Pairi Mango.	Ripe Alphonso Mango.
	p. c.	p. c.
Pulp to fruit	48·05	64·6
Moisture in pulp	79·30	81·3
	p. c.	p. c. on day matter
Total sugars	61·67	48·22
Reducing sugars	9·00	14·46
Non-reducing sugars	52·67	33·72
Acidity in terms of grammes of caustic potash per 100 grammes of juice.	0·499	0·352

	Alphonso fresh juice	Canned juice from Alphonso	Canned mango juice
	p. c.	p. c.	p. c.
Moisture	80·50	80·49	83·16
	Percent	on dry	Matter.
Total sugars	50·67	61·38	48·51
Non.reducing sugars	47·01	43·43	26·71
Reducing sugars	3·66	17·96	21.81
Acidity in terms of grammes of KOH per 100 grammes of juice.	0·944	0·423	3·00
	Percent	of tartaric	acid.
Acidity calculated as Tartaric acid	1·264	0·667	

"HOW CAN THE INSTITUTION OF THE LOCAL SELF GOVERNMENT BE USED TO FURTHER THE AGRICULTURAL PROGRESS OF THE BOMBAY PRESIDENCY."

BY

S. K. SANNABHADTI.

Sr. B. Ag, Class. (*Prize Essay.*)

Before considering as to how the local self Government be used to further the development of agriculture, we must have some idea of the local self-government and their functions in relation to agriculture.

"By local self government, as opposed to central government, is meant the administration of those matters which concern only the inhabitants of a particular place or district and which do not affect the nation at large."

The progress of local self government in this Presidency is a subject of great interest. Upto the year 1850, it was practically non-existent. That year the municipal committees were nominated in large cities and towns. The nominated members had very little power at that time. Year by year, they got more and more powers. There are in all 158 municipalities in this Presidency including the Bombay Municipality where the majority of the members are elected by the inhabitants and the population comes to 3,300,000.

The establishment of boards dealing with local affairs in rural areas is a recent development. There are only two classes of boards in Bombay. The district boards and the taluka boards. At the top comes the district boards with the general control over the local administration of the whole district. There are in all 242 boards in this Presidency. The greater part of the income of the rural boards is derived from a cess which they are empowered to levy on land which usually does not exceed one anna in a rupee on annual rent value in the Government assessment.

The establishment of the village panchyats is still a recent one. It consists of five members of the village or a group of villages. The

village headman should be the ex-officio. The other members are elected by the villagers.

The functions of the municipalities are classified under the heads of education, sanitation and public safety. The main normal functions of the rural boards are the maintenance of primary education, sanitation construction, and improvement of roads, up keep of medical institutions and veterinary work, the construction and maintenance of markets. Panchayats are concerned with the duties of sanitation and education of the village.

The convicti n of the local self-government is gaining its way towards the extension of the compulsory education. The future welfare of the citizens of the nation is in schools. They are the power-houses of inspiration. Schools, which build character and which produce intelligent public spirited citizenship, are among the greatest assets of the country For, after all, the purpose of education is not merely to make a living but a life. In spite of the many short-comings, the rural education int cduced by the local boards has a promising future. The high ideal for agricultural schools means the reversal of our system of education in rural communities. The farmer and his problems are now a centre of public interest. Every force in the country stands ready to co-operate in order that the great fundamental industry upon which every other industry depends, may be a success. The farmers will realise that their farms can be made to pay larger profits for the labour expended on them, and at the same time a greater return in food. The agricultural school is a crucial factor in the situation involving the advancement of agriculture and the future of the rural life. For, eradication of ignorance in agricultural pursuits must necessarily precede the inauguration of scientific agriculture. As a matter of fact, it is the most natural and efficient agency by which the information and new ideals affecting rural life can be introduced in rural communities. Also, primary education should contain more of technical subjects, and, allied sciences to boot, such as physics and meteriology which the villager needs in his after life to carry on agriculture successfully.

Health being the most valuable possession of man, it is necessary to know the laws governing its preservation for the community. This is done by sanitation. The chief cause of insanitation in a city, town or a village is the practice of depositing refuse and waste materials on the road side. Ninty percent of the people have no conception of this. It is the source of all diseases which are caused by insanitary conditions. Town sewage which consists of discharge

of latrines, urinals, waste water from baths discharge from factory yard washings and drainage water are also the causes of insanitation. These spread diseases by sprea l of hook worms and obnoxious odours which sport the food. The city of Bombay alone produces 960 tons of refuse daily. All these refuses consist of wat r containing animal, vegetable and mineral matter in suspension. This refuse consists mainly of nitrogen, and ammonia which, if applied to the soil as manure, increases the fertility of land. As the source of manure is limited the unutilised products should, by all means, be made use of for the successful cultivation of any crop. We require three kinds of manurial ingredients. They are nitrogen, phosphoric acid and potash. Out of these three, nothing needs our attention more particularly than the nitrogenous variety of the manures as the soil is depleted of nitrogen in a large measure by cultivation of all crops. It is well known that the World's supply of nitrogen is fast disappearing, and unless other sources are tapped, there is no doubt that we shall be faced with nitrogen-famine very soon. Agriculture being our main industry which furnishes food, the material for clothing, raw materials and other manufacturing concerns, the question of nitrogen should be well attended to. This problem can be easily solved when the local institutions like municipalities will. avail themselves of all the existing resources and use them as profitably as they can. In western countries, not a bit of this refuse is wasted. This will be clear from the statement of William Asher who suggested in the Royal Sanitary Institute Congress at Edinburgh that "every building should have galvanised iron covered bins suitable to its requirements which can be handled by a binman and it should be covered at all times." In villages also all this refuse should be properly used as manure. In some of the municipalities where there is no water-closet system, and sewage drainage, the method followed by the Poona municipality may be conveniently followed. The system followed here is the manufacture of pudrette, wherein the night soil is mixed with ash. Poudrette is recognised as an active and powerful manure, for all irrigated crops Thus, whenever it is possible, nitrogenous matter consumed in the form of food should be returned to the soil. In rural and semirural districts, marshy land can, with advantage, be reclaimed by depositing refuse. Lands thus reclaimed by filling refuses will bring a large amount of income and must necessarily increase the output of agricultural products apart from relieving conjestion of land.

Milk is one of the products through which diseases are carried and when it is under the insanitary conditions, is generally full of

harmful bacteria and unfit for human consumption. Majority of the population cannot go on without it. Milk is not a luxury but a necessity, being the most nutritious form of food. Children require it for their growth, adults for their nourishment and the invalids for their health. Supply of pure milk is of utmost importance. Superior and nutritious milk means, the superior milch cattle. This however is yet a "desideratum" in our Province, though our agricultural industry is purely dependent on animal-power. The efficiency of the cattle has to be secured by appointing trained dairy graduates who will teach illiterate milkmen the principles of dairying and animal-husbandry. Thus the trained milkmen will be able to supply pure milk by improving the milch cattle on which our dairy industry depends.

Cattle comprise the wealth of the agriculturists and perform most of the agricultural operations either with plough or with the cart. They also supply milk, manure and hide. The deterioration of the cattle is due to (i) want of adequate grazing ground (ii) want of good breeding and (iii) want of expert veterinary guidance.

The important draw-back for the improvement of cattle is the want of good sufficient grazing area It might be due to the pressure of growing population, which is so great as to have little or no pasture lands. This difficulty can be mended by the preservation of grazing grounds by legislation or by reclaiming land from the marshy areas as in Denmark.

The deterioration of the cattle is due to want of good breeding bulls. Formerly, in every village there were Brahmani bulls which were fed and allowed to roam about without any work. These were used as breeding bulls. As time passed on, these bulls deteriorated and thus the whole of the cattle in the village are poor in quality. If this work is entrusted to the villagers by distributing two or three breeding bulls for every village the condition of the cattle may improve to a certain extent.

Veterinary aid in this Province consists of 3 to 4 doctors in each district. Every year hundreds of cattle are passing away due to the diseases like anthrax and rinderpest for want of veterinary experts. If such an enormous number of cattle die every year, a time may come, when our agriculturists will have to feel keenly the scarcity of cattle. Therefore, the local self government should appoint more veterinary experts to carry on the work of inoculation

which will prevent the spread of such diseases. The work of castration of the bulls can as well be assigned to them. People not knowing the condition may advise the employment of tractors and other mechanical farm-appliances but our land holdings are small and scattered and our farmers are too poor to use them. It is therefore clear that the progress of agriculture in this Province is linked up with the welfare and improvement of cattle and the local self-government should turn their energy towards the improvement of cattle.

In olden times there were no roads. Man's wants were few. As times went on he required trails, roads and vehicles; and the modern inventions of machinery, with the advent of a net work of roads and railways all over, are, more or less, making us live in a system of world brother-hood without circumscribing us in our daily transactions of life. The road is an important factor, for, over it must be transported the food products to supply the city people and the manufacturers, and facilities for easy transport of agricultural products would be secured by roads interspersed in all the agricultural areas. Further, this would also help to remove the despair in distribution of cities and industrial centres. Industries thus would be decentralised and the ruralising tendency of the people in our Province would be minimised by better prospects awaiting them at these industrial centres. In many villages in this Presidency, there are no roads and the communication especially in rainy season is practically impossible. The local self government can take up the responsibility of construction and improvement of roads which link together the peasant and his products with the citizen and his market.

Seed must be regarded as an essential factor in the production of a crop. The use of the inferior seed which has lost its vitality due to long storage or insect attack, should be discarded. Approved good seed should be encouraged. The neglect of reliable good seed is, indeed, a most disappointing thing in our agricultural system. Our present-day-supply of seed is controlled by the village shopkeeper, who collects these grains by selling "gul' and oil and other supplies. The best part of his collection is purchased by the working classes for their daily use and the surplus is purchased by the cultivator for the seed. It is not an uncommon complaint that the seed does not germinate in spite of all good tillage and the fields are often resown. It is essential to investigate these conditions further to the satisfaction of the local-self government and the

only remedy to control these conditions is perhaps by the distribution of good seeds for the farmers.

The next in importance is the control regarding crop-pests. It is natural that the more area we put under crop the larger the number of pests. During the last twenty years, we have brought thousands of acres under cultivation in our canal tract, but at no time we have made any effort to keep these pests out of the area. We allow these pests to grow and then prescribe chemicals and insecticides for their destruction. This is not in any sense a novel idea. Even now it may not be regarded too late to adopt preventive measures against these pests and diseases. For instance we know that dipping of jowar in copper sulphate solution is very useful against the smuts. This should no longer be an item of delay but should be enforced by the panchayats, wherever jowar is grown and then alone the eradication of disease would be possible.

The health security of the community is as important a factor, as the educational activity, transportation and sanitation. Our rural population, which is the back-bone of our country is decreasing in an enormous number by the spread of diseases, for want of proper medical attendants and medicine. It is not possible for the local self government to establish hospitals in every village. The only way to solve this problem is by establishing hospitals for a group of villages and hence save the rural population of the Province. Thus, with the general establishment of rural hospitals, the health and the social phases of equality of agriculture with other industries will be nearer accomplishment.

The importance of preserving and introducing cottage industry is an important factor. From the point of view of the community, the survival of such industries has a distinct moral value. The products are finer and distinctly artistic and imaginative. And from the farmer's point of view, it is sure that he will be the master of his own labour. It will be a spare-time-work for him. When the industry is carried on in the village, there is economic gain in the village from possessing an industry of their own. The functions that can be done by the panchayats for the improvement of the cottage industries are :—

(1) The purchase of raw materials in large quantities at whole-sale rates.

(2) The establishment of an agency for the sale of the products.

All these can be carried on easily by co-operation.

The object of co-operation is to deal with stagnation of the poor classes and more especially the agriculturists, who constitute the bulk of the population. In spite of the growth of commerce and improvement in communications, the economic condition of the peasants cannot progress. The more obvious features of the situation presented themselves in the form of usury and land grabbing on the part of the money lending classes, while the agricultural classes either hoarded their savings or owing to thrift-lessness showed themselves unable to withstand bad seasons or to meet organised trade on equal terms. It is therefore necessary for the panchayats to take special interest in establishing co-operative societies, and joint stock companies, and to try all means to maintain them on an efficient basis. If this be done, the remedy for stagnation is that it is intended to meet not only the more obvious material evils but also the underlying moral deterioration to which our agriculturists have so long been exposed.

These, then, are some of the problems of the countryside confronting us in all their gravity and the suggestions aforesaid would be found quite workable by a hearty co-operation of the scientific and practical agriculture on the one hand and between the Government and the people on the other. We have no doubt a minister completely in charge of Agriculture; but it is of little import to look to him for the successful realisation of our aspirations. The carrying out of these suggestions and aspirations will necessarily entail on the Municipalities, Local Boards and Panchayats enhanced financial responsibility which is one of the difficult problems at present facing both Government and the Local bodies themselves. But there is and will ever be an increasing necessity for local bodies to develop to their full extent their own resources, if they wish to improve the conditions of agriculture and our Province; for

> " A bold peasantry our country's pride,
> When once destroyed can never be supplied."

THE PRESENT POSITION OF FRUIT CANNING INDUSTRY IN WESTERN INDIA.

BY

S. V. GODBOLE M. Sc., B. Ag.,

Agricultural College Poona.

---:o:---

With the extension of fruit culture in the Bombay Presidency methods have to be found out for the proper utilization of our fruit and especially the surplus quantity which cannot usually be disposed of except at a very low price. Among the several methods canning presents vast possibilities and is in fact the best method that can be adopted in the immediate future. The keeping quality of the canned material in the original fresh state has a distinct feature of finding a place for canned goods in distant markets.

The main principle involved in the process of canning is based on the complete exclusion of micro-organisms from food stuffs which is secured firstly by destroying those already present by means of heat and secondly by preventing their access by the use of hermetically sealed containers. Glass is found suitable for home canning only while the tin container is now a commercial success all over. Tin cans cost much less than glass and owing to ease in handling and less possibility of breakage they are very much preferable to glass.

The development of the world's canning industry is closely connected with the modifications and improvements brought about in can making. "Solder top" cans which have an opening at the top for the material to be placed inside and are closed by means of a cap were used throughout until recently; but these are rapidly being displaced by other ones known as "Sanitary cans". The solder top cans have now completely fallen into disuse in foreign countries owing to several disadvantages, chief of them being their high cost due to soldering, their unsuitability for substances bigger than their openings and lastly the possibility of the contents charring while the cap is being soldered on. Sanitary cans are cheap, and require no soldering. A sanitary can top carries a rubber film in its grooved edge and this can be secured on to the body without

the use of solder. Its opening is equal to the diameter of the can body and hence large pieces of fruit can be easily placed inside and sealed. To keep up uniformity among canners as to the size of cans sanitary cans of standard sizes are in use in the United States of America. Canning machinery has been built to suit standard sanitary can sizes and hence any one considering the installation of a canning plant in India would be benefited by the use of sanitary cans and other machinery which can handle them.

Establishment of a cannery on modern lines is a matter of heavy initial expenditure. It is not advisable to invest large sums in the beginning in any canning concern as there is the chance of its being a failure owing to some unforeseen circumstances. It is preferable to make an humble start and extend it cautiously as one gains confidence backed by experience. Attention is drawn to certain factors affecting seriously the successful working of a canning concern.

Working Season. The canning season should last from six to eight months in a year and hence it is desirable to can one thing or the other to keep up continuity in working. There are instances of factories which have taken to manufacturing biscuits in times when fruits or vegetables were not available. Canneries located in Konkan for the purpose of mango canning work only for a month and hence their suceess as commerical concerns is very much uncertain.

Raw Material.—A regular supply of sound fruit in quantities sufficient to permit profitable operation must be available at cheap rates.

Tin cans. Canneries in the Bombay Presidency are using at present solder top cans. They are either manufactured in their own factories or ordered from Bombay. Bombay-made cans due to defective soldering are often leaky and it is necessary to repair the leakages before using. One of the canning concerns in Konkan intends to manufacture sanitary cans in the immediate future.

Trained labour. There is a great need of trained men capable of taking charge of several operations of cannery. Most tinmen are not trained properly and the soldering work cannot be entrusted to them without the risk of a heavy loss due to breakage. Men in charge of the process room should also be highly experienced as otherwise a slight mistake on their part would result in entire loss of the package.

Marketing. Most canners in U. S. A. supply their canned goods to wholesalers who sell them under their own brands. This system

not only curtails advertising expenses but also enables the canner to realize the value for his goods whenever he desires. In India every canner has to establish his own brand in the market to enable him to dispose of his goods and this system though having some advantages is very costly.

Owing to several unfavourable circumstances the canning in dustry in Western India has to cope with many difficulties at present. The prices of canned fruits are fixed so high that an average buyer finds it hard to purchase them. The demand from foreign countries for Indian canned goods is very much limited at present but there is the possibility of its increase when canned goods are available at cheaper rates. The availability of sanitary cans at cheaper prices and the extension of the canning season for over six months during the year are the most important factors affecting economy in production and consequently the progress of this industry.

HEGGEBHATTAH A VARIETY OF RICE BEST SUITED FOR SWAMPY RICE-FIELDS.

BY

M. R. GOKARN, B. Ag.

(*Agricultural Overseer Kanara.*)

———(o)———

Rice is a crop which is noted for the largest number of varieties. Though essentially a crop of tropical and sub-tropical regions, it has adapted itself to varying conditions of soil, claimate and rainfall. It can grow in a most sandy soil with rainfall of 90–150″ or over when provided with sufficient quantity of farm yard manure; and eqally so on heavy sticky soils of low rain fall when fed with artificial irrigation; nor has it failed to adapt under conditions of brakish salt lands of the creeks and sticky red loams under the deep valleys amidst forest ridden hills under torrential rains of 200″ and above. A variety under the best named category is found in the Kanara district, grown with particular methods of cultivation, a description of which may be of interest to the readers of the College Magazine.

Kanara is well-known as a forest tract with 82 p. c. of thick jungle and 18 p. c. of cultivable lands; and a range of Sahyadri hills pass as near as 5-10miles near the coast at Karwar, in the north, and upto 18-20 miles greatest distance from Honawar, Bhatkal in the south. These ghats are covered with dense forest dotted with large beautiful spice gardens, where the temperature falls as low as 59" F in November-December with severe chill and rises to 91" F in May. On the crest of these ghats the south-west monsoon currents with their silvery clouds striking amidst green azure of Nature's bounty the high towering ever green trees of Termilalias, Jack Caryota etc. drop their fulfilment with a vengeance recording heaviest rain fall upto 300." The soil is a typical one in those valleys red or reddish, yellow alluvial, clay loam with shining particles of Mica called 'Kagadali,' well-known for its moisture holding capacity. It is under such conditions that a variety of rice called Heggabhatta is found to be grown with a very satisfactory yield.

Home of the variety :—The interior villages of the garden tract of Sirsi, and Shiddapur form the home of this variety. The lands are situated in the valleys between two hill-slopes, generally long and narrow, with precipitous streams pouring down waters in the rains which fall in deep gullies and pools and hence the situations are mostly swampy with water for nearly 10 months in the year. It is only in hot summer of April-May that the lands get somewhat dry. Deep side-drains on both sides of the slopes are hence the common feature of these regions. Adjoining the spice-gardens where the valleys broaden, the rice fields are situated terraced gradually to drain off water. The fields are oblong with disproportionate breadth. Some of these fields are so swampy requiring to be hand-dug as the bullock cannot work. There are some spots marked out from generations called "डोंबेसरु Dombe saru" (where the foot of a man may penetrate knee-deep or more) such places are filled with stone-boulders, twigs of plants and bamboo pieces to drain off excess of water.

Prepartion of the land :—Ploughing is done with country plough in the month of November-December and the clods crushed with thick wooden plank called "Koradu". The fields are made to slope a bit towards the lower side and the bunds are repaired to collect water when not so swampy. Just before transplanting the ploughing is done, holding necessary water which operation is called "अद्दु हौडे."

Manure :—Five to ten cart loads of dry leaves from the jungle are applied at the time of last ploughing.

Seed-bed:—This is prepared in the month of January as for ordinary seed-bed with low seed rate of 45–50 lbs. as against 80 lbs. for normal fields. The seedlings get ready within 30-45 days. Water is allowed to soak in for the first night and drained off next morning; this process being repeated for 3 times at intervals of 3–4 days. When the seedlings are 4″ high water is allowed freely. If water logged, the seedlings are likely to rot.

Transplanting:—During the interval of raising seedlings, the land is prepared after ploughing 3–4 times or hand dug in patches where bullocks cannot work. Seedlings are planted in bunches of six to eight-12″-15″ apart in the month of February. Ten to twelve men are required; unlike for ordinary fields, women labour is not able to cope with this operation on account of knee deep swamphy patches. These as already mentioned being spotted out, the bottom portions of bamboos, with foot holds of uncut latterals from a sort of ladder with the help of which, the men manage to transplant the area. There are not rare instances where stray cattle-calves have got themselves burried and lost in these miry pits. Owing to internal springs communicating with the hill streams, the pits are difficult to be filled in, in spite of the stone-boulders, branches, etc. rubbish chiefly betelnut husks, being annually used as routine operations- In the fair season these patches are found thickly matted with grass and weeds that a stranger can easily get himself entrapped.

Weeding is done twice in July and September. Watching against wild animals is a necessity of the tract. There are some devices used for this as tying empty tins to a wooden post with a rope of jungle creeper or plaintain fire which is repeatedly shaken by the watchman to scare out small animals. There is a particular device which may be worth mentioning. For this a hollow bamboo piece 4–6″ diameter and 2 feet long is taken with three internodes one of which is carved out to admit of flow of water being kept at the edge of a bandh. A cross stick passes through hollowed internode supported by 2 arms 12″–15″ implanted in the lower field. A stone is kept at the off end (empty portion) as to strike the bamboo. The water is made to flow in the bamboo through a sprout and the balance being heavy on the lever age it pours down the water in course of which process, the bamboo end strikes the stone with a noise " thud, thud ". These devices have become so common that the shrewd instinct of wild animals, must have felt the harmlessness of these time long, perhaps only to give scope for the cultivator to try this ingenuity.

Harvesting:—This is done in the month of November just along with other varieties. Thus the variety takes 9 to 10 months to grow.

The crop grows to a height of 5′–5½′ with heavy tillering 10–15 in number with large ear-heads about one foot long. The growth in the summer is comparatively short about 1½ feet only but quickly makes up the height with the advance of rains. There are two varieties—white-grained and red-grained—the latter is considered suited for very low lying fields; the grain is medium, thick and reddish. This Rice is considered perhaps, being most glutinous, to be indigestable to those unaccustomed to this variety, causing flatulance and requires more quantity of ghee. The yield comes to 20–25 bags (150 lbs per bag) per acre while other varieties as Jaddu, Nullare, would yield 15 bags normally.

This variety grown under normal conditions is ready for harvest in 5 or 6 months.

These lands get too much water-soaked by taking repeated crops and physical condition is lost under the puddled conditions of the rice cultivation, the swampy patches getting more unworkable. Hence occasional rest is given for a couple of years or more, so that, the soil is exposed to the sun and air to crack and recoup the lost condition.

Conclusion:—These lands may be improved by systematic adaption of drainage pipes and open trenches crosswise at short distance. But it would be a matter of expense. There are so many waste lands in the villages for want of labour, that people would prefer to have the lands given short rest rather than invest a large sum of improvement.

THE INDEBTEDNESS OF VILLAGE INDIA.

BY

R. S. INAMDAR, B. Ag. (Bomb.) B. A. (Cantab.)

Professor of Botany at the Benares Hindu University

During a period of convalescence of about four months, I had to go back to village life after an absence from it of about twelve years. Naturally my attention was drawn towards the indebtedness of the cultivators which, with the relief measures which the Government have been attempting to introduce during the last quarter of a century, one expected to find to be on the decrease. To my surprise, however, I was forced to the conclusion that if accurate statistics on a comparative basis were available, one would find that the indebtedness is perhaps on the increase due to the very same relief measures which are supposed to free the cultivator from the usury of the money-lender.

An analysis of the causes which are tending to produce this result is not very difficult. The easy accessibility of money to the borrower which particularly the increase in the number of village co-operative societies is introducing and the comparatively light conditions imposed on the borrower for repayment, measures which were undoubtedly originally intended to dislodge the money-lender from his harmful position, have, in themselves, one is afraid, tended to produce a result, which, if continued, will not, in the long run prove beneficial to agricultural India. In the enthusiasm exhibited by Government officials and the leading public men alike in India towards enhancing the activities of the co-operative movement, this point, it would appear, has entirely been lost sight of, with the result that the public, while possessing a knowledge of detailed statistics regarding an increase in the number of village co-operative socities, is kept ignorant of the harmful results which they are, in the aggregate, producing. For example, this aspect of the problem, it appears, has hardly been discussed before the Royal Agricultural commission which is now sitting.

The movement of co-operative credit was introduced in India with a view to encourage thrift amongst the cultivators in the first

instance, and secondly to enable them to find an easy accessibility to credit for the improvement of agriculture or rural business, minimising waste on unnecessary social ceremonies and litigation, which have been the bane of rural India. A close study of the working of these societies would go to show, on the other hand, that neither of these expectations is fully realised in actual practice. The fact that they have been recieving deposits from the rural public is no evidence that the cultivator is learning thrift. It is the well-to-do man that can afford to deposit his savings in the society, which, previous to its existence, he was attempting to lend privately to his needy neighbour. In other words, the deposits which the societies are recieving are merely evidences that a greater assurance is afforded to the numerous small money-lenders, who previously fought shy of lending on account of the difficulty of realising the loan, especially in the face of competition with the established Sowcar, and had thus to find an opening for their money by way of business. The unlimted liability system on the one hand and the saving of the trouble over litigation on the other, have merely tended to encourage a large class of small money-lenders in co-operation, with the result that the introduction of co-operative credit has created enormous facilities for lending money on a much larger scale than used to exist previously. Add to this the easy credit with which these societies can borrow money for purposes of lending, and an adequate idea can be had of the expanding amount of money-lending that is being introduced of late in the villages.

Borrowing is done to the extent money is lent on easy credit. The plea that the interest charged by a net work of credit societies is much less than what the borrower had to pay previously to the money-lender can hardly be advanced as an adequate excuse for creating facilities to encourage indebtedness amongst the rural population, unless one finds that the money borrowed is put to some beneficial use which is likely to bring greater benefit by way of business. This, however, is not the case. Though it is laid down in the bye-laws of the societies that money should be lent on approved security for agricultural puroposes, in a large number of cases the money so borrowed is utilised for purposes other than the improvement of the land. The members of the society hardly care to know what happens to the money after once it is borrowed, so long as they feel assured that they can safely realise the loan in case of default of payment. Under these circumstances the easy availability of credit has tended, if anything, to encourage

spendthriftness and waste amongst the cultivators rather than thrift. The established hesitation and fear for running into indebtedness lest one falls an easy prey to the usury of the money-lender, has disappeared entirely, because, in the absence of a sudden ruin, the modern borrower can run into perpetual indebtedness with the assurance that he can continue paying his debt in easy instalments, only to borrow again in advance of his savings. The cultivators are thus encouraged directly to maintain their spendthriftness in unnecessary evils, as for example, litigation, which is alarmingly on the increase in the villages, or newer forms of social luxuries which have augmented the old. Perhaps India is the only country where money-lending is thus directly encouraged by the state purely as a business for purposes other than helping productiveness.

These are all social problems which are not necessarily learnt by a mere study of statistics. They require careful observation periodically of the rapid changes which village India is passing through by men who have an experience of village life, together with a wide outlook on problems of national economy. It appears from the foregoing description that the encouragement of co-operative credit in India has merely shifted the business of money-lending from the hands of the Sowcar to a body of small money-lenders in co-operation, without in any way reducing the indebtedness of the cultivators. On the other hand there are grave indications that borrowing is on the increase for purposes not entirely beneficial. The usual safegaurds that money should be lent only for productive purposes can hardly prove adequate in actual practice, since the societies will have an eye more towards business than towards philanthropy. While encouraging co-operation for various other purposes, it seems, therefore. necessary to restrict support to the credit societies in future and abolish many of them in case it is found that they are tending to increase indebtedness in the aggregate. Now that the Sowcar is under a disability of law in various forms, one is prepared to go to the extent of stating that it must be made difficult for the cultivator under his present social conditions to borrow for any purposes, even for the improvement of his own lands, so that it will be necessary for him to accumulate his own savings for the purpose. Agriculture is not a business unlike commerce which can thrive on credit. One hopes that the attention of the co-operative department and the Royal Commission on agriculture will be drawn towards this problem which is likely to prove serious in the near future.

REVIEWS.

THE CELESTIAL EMPIRE China: Land of Famine. By Walter H. Maliory. (American Geographical Society, New York.) 1926. 10¼ × 6¾. pp. xvi, 199.

The author's purpose in writing this book is to set forth in brief why China has so many famines and what, in his opinion, can be done to prevent them. It has been shown that there is famine almost every year in one province or another in China. Some of the famines are extremely bad The one in North China in the year 1920–21 was so severe that at the height of the distress nearly 20,000,000 people were destitute and 500,000 people perished on account of the famine. The causes of the famines have been classified by the author into econo nic, natural, political and social, and suggestions are made to remedy these.

Many of the economic and social conditions and some of the natural conditions in China are very similar to those in India. The book therefore is of special interest to students of agricultural and economic conditions of India.

Except in Manchuria and some small areas here and there, there is overcrowding in China. The number of inhabitants to the square mile varies from 980 in some villages to 6880 in others. This condition is worse than in India, because in Bengal where we have very densely peopled areas there are 1162 persons to the square mile of cultivated land. Fragmentation of land therefore has gone to the extreme limit in China. It has been estimated that 4·7 acres are necessary to provide food and other necessities for a family of five. But 33 per cent, of the holdings are less than one acre in area and 55 per cent. are one and one-half acres, while the number of large farms is very small. Several economists who have collected information put down the annual requirements for a family of five at $150 or at least at $100, and the Chinese Government Bureau of Economic Information arrive nearly at the same results. The figures are for the minimum requirements according to the standard of the farmers; but it does not mean that they are able to get even this minimum. It is found that more than half of the population of

the villages lives below the poverty line. In China the birth rate is abnormally high as also is the death rate. The check against increase in population is by famine, disease and war. The total effect is therefore that the inhabitants are ill fed, insufficiently clothed, aud oftentimes without shelter. This is the general state of affiairs and to increase the misery there are certain natural causes. We have the famine occurring almost every year due in some parts to want of proper rainfall and in others to floods of such rivers as the Hwai and the Yellow or the rivers of Chihli province. The famines are in some cases due to the ravages of insects and diseases of plants. This is the reason why China is called the land of famine. The political cause of famine is the civil war. Civil wars as any other wars must bring on famine and misery and there is no wonder therefore that the civil wars in China have added to the already existing famine conditions. Some of the social causes of famine mentioned by the author such as early marriage, waste in ceremonies and feasts or overeating need not be taken very seriously, because they by themselves cannot bring on famines if all the other conditions are satisfactory.

There are several economic cures proposed by the author. One of the important cures suggested is colonization in the thinly populated areas of Manchuria, &c. This will give relief to the densely crowded provinces. The cure would last at least until the plains again become overpopulated. The Chinese believe that after death they must be buried in their anscestral land and that they must live on their inherited land to protect the graves of their forefathers. Every plot carries grave mounds and the plough must piously wend its way between the tombstones. Mr. Mallory says in one place that the thickly populated regions, where the land is good and where it is most needed for agriculture, are just those where graves are most numerous. Slowly, however, the idea of colonization is taking root and actually some companies have been formed in this connection. The "frontier movement" of Dr. Yu Liun Hugh is probably one of the best known projects dealing with the question of moving population from overcrowded to sparsely settled regions. The other economic cures suggested include the introduction of improved methods of agriculture, credit facilities, uniform coinage, better transportation facilities and food conservation, &c. These are general suggestions and the author has seen that each is not a complete cure but contributes its share to the general cure. The following extract from the book shows how several of the conditions in China are similar to those in India. In

one place he says: "In China it is not customary for an educated man to engage in manual work of any sort. Farmers' sons who have had the advantage of going away to school do not return to the farm after finishing their agricultural course, but seek an opportunity to teach; and many of them who fail in finding such employment drift into other lines of work where their special training is lost but where their dignity as men of education is preserved."

It seems absolutely necessary to relieve the congestion on agriculture. According to the author, the industrial development of China will do much to remove the excess of labour which is at present such a burden on the land. It is only in China and India that we have such a large proportion of a crowded population working on land. The author has struck the right note in suggesting industrial development. The opening of factories in the principal parts in China has already had a noticeable effect in neighbouring districts. Home and village industries also will be very helpful.

Amongst the natural causes of famine are irregularity and scarcity of rainfall and flooding of rivers. Some people suggest that if there are forests of sufficient extent they will ensure ample and regular rainfall. This is doubtful. At any rate scientists are not agreed on this point and it is also doubtful whether sufficiently large areas can be put under forests in China. It is, however, right to encourage tree planting, wherever possible. The author discusses at length several schemes of irrigation. These when completed will certainly be of great value. They will be doubly useful. If proper dams are put up, the floods would be checked and the accumulated waters can be utilised for irrigating crops. This is not altogether a new thing in China. What is wanted is the proper control of the existing dams and putting up of new ones in suitable places.

Amongst the social cures the author discusses a very important question which is of interest to people even outside China; and that is birth control. China is already crowded and the population is increasing. With preventive medicines and modern surgery the death rate will be lowered without lowering the birth rate and all the increase in the outturn due to improvements in agriculture &c. would go to the increased population and China will still remain under starvation. The author is very keen on birth control and he even proposes a department for teaching methods of contraception. From what we know we think it is an extremely difficult matter to introduce birth-control where it is most needed. This may, however

be tried along with other measures of relief as there must be limits to the population which land can support. There is one suggestion made by the author in this connection, with which very few people will agree. He says that the Chinese may object to birth-control on religious grounds and therefore if Confucianism is displaced by Christianity the difficulty will be removed. It is however a well known fact that birth-control is opposed by Christians on religious grounds and the introduction of Christianity will simply make matters worse.

The book, on the whole, is full of information and suggestions on the question of the famine conditions in China and will be valuable to those who are working to solve the problem in China and also to those who are engaged in a similar work outside.

D. L. S.

ECONOMIC ORGANISATION OF INDIAN VILLAGES Vol. I. Deltaic Villages. Pages 223.

By N. G. RANGA, B. Litt. (Oxon)

The Economic Organisation of Indian Villages is the first publication of the Andhra Economic Series, and contains very valuable information on the economic life obtained in the Deltaic villages of the Guntur Districts in the Madras Presidency. The author – Mr. N. G. Ranga, B. Litt. has prepared this volume under the able guidance of Dr. Gilbert Slater while he was at Oxford. Mr. C. R. Reddi has written the introduction to the volume wherein he warmly commends the volume to the public.

The field of enquiry which the author has chosen extends over seven villages in two Taluks-Bapatla and Tenali though conditions obtained in a third Taluk are often alluded to.

It would have been easier for the readers to follow the information if the author would have shown the relative positions of these seven villages by means of a small sketch map of the area The two chief reasons for taking these villages from Guntur District are (1) the steady increase in the population in the last 30 years, much faster than that of the Presidency and (2) the greater percentage of the cultivable area in the Guntur District viz. 74. 5 as compared with 60. 1 for the Presidency.

The main crops grown in the District are Cholam, Rice and other food grains but the villages under enquiry grow more of paddy crop under irrigation. The population consists mostly of Kammas or caste Hindus and Malas and Madigas or the panchamas. In addition to these there are usually a few Mohamedan and a few Christian families in each village.

The land in these villages is not equally distributed. In severa villages more than half the population in landless which mainly consists of panchamas. According to the census report of 1921, out of 1000 peasons, nearly 400 are cultivating land-owners, 240 are cultivating tenants, only 56 non-cultivating land-owners while the rest are either field labourers or farm servants.

The normal rain-fall of Guntur District is a little more than 31 inches.

The author very briefly describes the paddy cultivation and alludes to the small-holdings of the Ryots. The majority of holdings in these villages are of less than 10 acres. Where there is dry land, the holdings tend to be larger. The evils of sub-division and fragmentation are dealt with. Their form at on the standard of living on Ryots and workers, discloses the very simple meals the people are accustomed to take consisting mainly of rice with some kind of curry.

With regard to the money lending some of the author's remarks are interesting and reveal the condition of the Ryots as well as money- lenders thus" * * * the number of people who try to evade paying their debts is fast increasing * * *. There were three insolvencies in Nidubrolu village in last 10 years and nearly Rs. 50,000 was lost. So, rich Ryots are decreasing in their importance as rural bankers. This reluctance of the rich Ro452 to lend to every one has resulted in the introduction of Marwaris as rural bankers.

The author devotes one whole chapter to farm cost enquiry. Very useful and interesting detailed data have been collected showing the agricultural budgets of a large number of Ryots from the seven villages. Most of these Ryots have got wet lands in addition to some dry area. The net income of the wet lands per acre varies from nearly Rs. 30 to Rs. 110 while the total annual income of a Ryot varies from Rs. 360 to Rs. 2250 according to the extent of his holding. The cattle budgets collected indicate that the cattle are a source of annual loss in many cases while in cases where they prove profitable, the profits are comparitively very small. On the

whole the cultivating Ryots whose budgets are here given are almost all solvent spending per adult annually about Rs. 130. It must be remembered that this comparatively satisfactory state of the cultivators is mainly due to the certainty of annual crops on account of the irrigation facility and the intensive nature of Agriculture carried on by them.

But the economic conditions of the labour in this District are far from satisfactory. They include the landless labourers and the depressed classes. There are periods of unemployments during the year amounting nearly to one third the number of days. The weavers in the district are even in less satisfactory state than the other labourers. All these labourers are living on the margin of subsistence. It is computed that the average annual income per head of the weaver in the Madras presidency is about Rs. 64 and that of Sudra worker and the Panchama varies from Rs. 56 to Rs. 64. The average income of the Ryot of dry villages amounts to Rs. 77 while that of the Panchama on dry lands is only Rs. 50.

The author has taken very great pains in collecting very detailed information of each family whose budgets have been discussed in the volume.

On the whole the first volume of the Andhra Economic Series is a very useful and valuable addition to the books on Indian Economics and we heartily commend it not only to the students of Economics but to the general public as well.

N. V. K.

AN EASY METHOD OF EQUIDISTANT SOWING IN SMALL SEED-BEDS

BY

S. G. BHALERAO Esq. B. Ag.

Rice Breeder, for Mallad, Mugad (Dharwar).

---:o:---

The following few lines have reference to the experience of the writer while working on the rice crop for the last few years.

The equidistant sowing of seeds for obtaining seedlings under uniform spacing for transplanting for the purpose of plant to plant study has been engaging the attention of the writer since 1921. Various methods have been tried for the purpose before now. Frames interwoven with strings placed at equal distances both length wise and breadthwise were superposed on the seed-beds and pits were made by hand to receive subsequently the seeds to be dropped in them one by one by hands. The method was sufficiently troublesome and was replaced by card boards with holes drilled through them at equal distances to be placed on the bed so that with the help of a rod easily fitting these holes small pits could be made on the soil surface below in which seeds had to be subsequently dropped one by one by hand. Even this method though a decided improvement over the use of the frames had the disadvantages in that (1) the marking of the pits took time (2) the depositing of the seed took us much time again. (3) there was occasional chance of allowing a few pits to be without any seeds in them and even a more serious mis-chance of depositing two seeds in one pit in some cases by a slip of fingers, as the pits had to be broad and deep enough respectively to allow easy working and proper deposition of the seed. In fact the whole thing could be deemed unmanageable except in a rainless fair weather when every material the board, the working rod the seed and the fingers of the server were quite dry the seedbed of course being just moist enough to allow easy working.

As an improvement over this in 1927 was tried at Mugad with absolute ease and great success the method mentioned below in sowing rice seeds in an equidistant manner :—

Conveniently before the time of sowing, thin paper (3 lb paper used in typing will do quite well) was ruled both ways to give squares of required dimensions. Carbon paper could be easily used to give 6 copies at a time in ruling. The crossing points of the lines on these papers were marked with small drops of fairly thick gum and seed were spread over the same so that they would be held in by the drops of gum. A little scrutiny and some hand work were needed to make sure that every drop of gum had one and only one seed on it. The papers so prepared were dried in shade and stored in brownpaper pads till the time of sowing when they were spread on the seed-beds and covered with a fairly thick layer of dry sail specially preserved for the purpose The seedlings came up quite nicely in due course of time.

The advantages of the method are very evident.

1. The work of preparing the papers with seeds on them can be done at leisure in advance of the time of sowing and under the easy conditions of the laboratory rather than doing every thing hurriedly at the time of sowing under the adverse conditions of the open field.

2. The work can be made so mechanical as to be got done from a man of very average understanding requiring personal superivision only in dealing with one sample at a time and correctly recording the number of the sample on the paper on which it is pasted.

3. The irregularity involved in leaving gaps and the danger in putting two seeds in one place are obviated as the paper is open for clear visual inspection and amenable to easy correction.

4. On account of the ease in working mentioned above works of larger magnitude can be easily handled within a given time.

The roots easily penetrate the thin paper to reach the nutrition and mositure in the soil below and the paper itself rots away while the little quantity of gum used is easily dissolved.

The method is likely to be of use in rice work at all stations where equidistant sowing of large quantities of seed is a necessity. It might also be used with the Nagli crop in which case the gum drops will have to be mere dots put with a small point. In general it is useful for crops where equidistant sowing of single seeds on a small scale is the problem.

THE BOMBAY AGRICULTURAL GRADUATES' ASSOCIATION.

An Extra ordinary General Body Meeting.

An extraordinary General body meeting of the Bombay agricultura Graduates Association was held, as previously announced on the 11th of August 1927. The meeting was called for two specific purposes. (1) To take the opportunity of the College Social Gathering, to bring the Members of the association together, as a number of Graduates was expected to attend it as past students and (2) to discuss on some important agricultural topics. (It is also customary to hold such a meeting at the time of Social Gathering of the Agricultural College.)

The proceedings commenced punctually at 4-30 p. m. Rao Saheb B. P. Wagholkar was proposed to the chair. Mr. V. N. Gokhale, one of the Hon. Secretaries, after wel-coming the members read a short report of the work for the past six months. Rao Bahadur P. C. Patil then opened up the discussion.

The topic already announced for the discussion was "Is net profit the only criterion to select a crop". Along with this subject Rao Bahadur Patil introduced another as well viz. "should the New canal (Nira Right-bank) be closed for sugar-cane crop" as the cane was not paying now a days. He said that both these topics were equally important and he would like the house to deliberate over and give a careful consideration to both of these.

In introducing the second subject first–viz. of cane growing, Rao Bahadur Patil said that it did not pay the cultivator to grow the cane-crop, as the average yield had gone down to the extent of twenty pallas per acre. He also said that prices of various articles having gone high, the labour was dear and the cost of raising gul naturally had gone high whereas prices for Gul were going down. It does not pay therefore to the cultivator to grow the cane crop. The cultivator derived the benifits of the boom of war effects and that was why he was able to pull on for the last few years. He gave some instances in support of his statement. He then said that if canal be closed for cane crop and the irrigation given to other crops being taken instead such as cotton, groundnut &c. the cultivator as well as Government would be benefited. The Government

would be a gainer as they would get water charges for two crops in a year and for less quantity of water. This remaining water could be utilised for additional area of such crops; and the cultivators in dry areas would also be benefited as he would get adequate labour income.

In introducing the other topic he gave some figures and said that the net profit in Jowar was eighteen Rupees, that in Ground-nut was thirteen rupees and in Cotton it was only Rupees four per acre. This was not a considerable sum over which the farmer could base his crops. Yet he takes to cotton. Why? With all this the cultivator selects these crops and it is chiefly because he gets labour for himself and his family. He can also get sufficient for his bullocks to keep going on.

Rao Saheb Wagholkar, in inviting discussion, said that before going to some such radical measures of stopping the canals for cane crop, we must convince ourselves whether the outturn of cane had really gone down as low as twenty pallas. He said that he had come across with four or five types of farmers during his cotton investigation work and the yield of crop varied according to the types. He thought that the yield had not gone so low as twenty pallas, but it was a matter for thorough investigation.

Mr. Nagpurkar gave an illustration of a cane grower at Hadapsar who had been not only maintaining a large family very comfortably on an area of 7 or 8 acres under cane but he was making a lot of profit over it. Mr. B. H. Patil said that the cotton crop paid more than any other crop in the Dharwar district and that was why the cultivators took to it. The average net income per acre was nine to ten rupees under Dharwar condition.

Mr. V. G. Gokhale said that one should not take the alarmist view and go to the extent of closing the canals for cane crop. He said that the Government would not be a gainer as was just pointed out, as the growing of other crops depended more or less upon the rains which were uncertain. Then there was the question of rotation of crops that had to be considered as well. He said that the things should be left to adjust themselves. If cane crop was not paying the cultivator would naturally give it up.

Mr. V. N. Gokhale said that the low yield of twenty pallas in case of Bellapur Sugar Factory which was quoted by R. B. Patil as one of the examples, would not be taken as a standard in collecting the data as the aim of the factory was to give work to the factory for a longer period, than to get the highest ynld. If they wished,

the factory managers could surely get yield higher than what they are getting at present. Mr. Swadi said that the problem of cane growing differed considerably in three different tract as Upper India, South India, the Deccan and *Poona.* The Poona problem was more complex and the cultivator was not a gainer in cane-crop. He advocated the introduction of new varieties in place of the varieties not paying at present.

R. B. Patil gave replies to a few points raised during the discussion and further deliberations had to be stopped for want of time.

There was a fairly large attendance of over sixty graduates. The meeting terminated with a vote of thanks to the chair and the members were afterwards treated with tea and light refershments.

Hon. Secretaries.

D. O. No. of 1927-28.
College of Agriculture,
Poona, August 1927.

To,

The old graduates of the Agricultural College, Poona,
and others interested in the Agricultural
College and Agriculture.

Sirs,

I am giving below a list of the Agricultural graduates

(1) Working on their own or hired farms
(2) Working as managers or overseers of private farms
(3) Running business connected with Agriculture on their own account;
(4) Working in business connected with Agriculture for others.

I will be much obliged if you will kindly go over the list and inform me the names, addresses and occupations of Agricultural graduates whom you may be knowing and who are not included in the list. Graduates in Bombay Government service may be eliminated.

Yours sincerely,
P. C. PATIL
Professor of Agricultural
Economics, and
Ag. Principal.

THE BOMBAY AGRICULTURAL GRADUATES.

Serial No.	Name of the Graduate.	Address.	Kind of business he is engaged.
		PRIVATE FARMING.	
1	S. V. Tilak	Pen (Kolaba)	Private farming
2	G. M. Khandekar	52, Nandlalpura Indore (C. I.)	,,
3	B. M. Joshi	C/o. Sir Moropant Joshi Nagpur	,,
4	S. K. Kukday	C/o. Colonel Kukday Nagpur	,,
5	B. B. Navalkar	Kamshet (G. I. P. Ry.)	,,
6	S. R. Paranjpape	Kelva Mahim (Thana)	,,
7	K. B. Bhagwat	Loni-Kalbhor	,,
8	S. R. Badami		,,
9	K. S. Phatarpekar	Belgaum	,,
10	S. B. Harlikar	Chikodi	,,
11	M. A. Jagtiani	Duhd Lane Hyderabad (Sind)	,,
12	H. H. Advani	Near Munl. Office Hydrabad (Sind)	,,
13	R. T. Mirchandani	Hirabad Quarters Hydrabad Sind	,,
14	S. H. Advani	Do.	,,
15	T. V. Ganpule	Kopergaon	Private farming
16	N. V. Kulkarni	Borli Panchatan Janjira State Kolaba Dist.	,,
17	D. K. Marphatia	Dholakuva farm Rajpipla State	,,
18	R. S. Bhat	Ahmedabad	,,
19	B. J. Desai	Madhav Bag Ahmedabad	,,
20	Y. R. Joshi	Sajot (Broach Dis.)	,,
21	D. C. Saruwala	Keem (Surat Dist.)	,,
22	H. G. Mehta	UmrethDist. Kaira	,,
23	A. T. Shah	Lakh Dist Ahmednagar	,,
24	G. D. Patel	Do.	,,

Serial No.	Name of the Graduates.	Address.	Kind of business he is engaged.
25	Adiram Singal (Diploma)	Agra	Private Farming
26	N. G. Gole	Indore State	”
27	Bavamian Syed	Palanpur	”
28	D. M. Kurtksh	Kurtksh (Dist. Dharwar)	Private Farming
29	G. C. Limaye	Bhatkunti Indi Dist. Bijapur	”
30	Alur Shamarao (Diploma)	Hospet Bellary Dist.	”
31	A. M. Patel	Nurseryman Vapi Post Challa Via Daman Rd. B. B. C. I. Ry.	”
32	G. B. Kulkarni	Harigaon Padhegaon Tal. Kopergaon.	Private Farming
33	M. S. Patel	Shukla Firtha Ashram Broach Dist	Private Farming
34	R. V. Nadgowda	Mundergi Tal. Gadag	Private Farming
35	V. B. Desai	Shukrawar Peth Dharwar	”
36	V. B. Marathe	Amgol Mal Belgaum	”
37	S. B. Mahajani	Chikodi	”
38	S. R. Nadig	Mahgi Peth Mundagod Dist. Karwar	Private Farming
39	V. V. Shirgaonkar	Belgaum	Private Farming
40	Khot		Banes Farm Sanhvaswad
41	G. K. Tatke	Kopergaon	
42	B. V. Lhiroli	Bhatkal	Private Farming
43	B. S. Gupla	Drug C. P.	”
44	M. G. Athalya	Wakad Nasik	”
45	R. R. Kale	C. P.	”
46	M. M. Masani	Gholwad	”
47	Kulkarni	Chincholi	”
48	C. R. Oza	Bhavnagar	”
49	Baluch Kadardak	Mirpurkhas	”
50	D. P. Chitale	Ahmednagar	”
51	M. D. Wad	Nasik	”
52	R. K. Desai	Abrama Surat Dis.	”
53	A. A. Khatik	Belgaum	”
54	Chinoy		”
55	B. N. Roy	Bengal	”

Serial No.	Name of the Graduates.	Address.	Kind of business he is engaged.
56	Armugham	Ceylon	Private Farming
57	G. C. Ochhani		,,
58	D. B. Basuyat	Nepal	,,
59	Ahmad	Assam	,,
60	P. A. Kokatnur		,,

Serial No.	Name of the Graduates.	Address.
	WORKING MANAGERS OR OVERSEEERS.	
1	N. G. Masur	Chikodi Taluka Dev
2	G. R. Mahajan	Belapur
3	Y. M. Parnerkar	Sabarmati Dairy Manager
4	T. P. Shah	Bombay Goshala
5	J. G. Athavale	Taluka Dev Association
6	K. C. Naik	Montgomery
7	S. S. Wagh	Sirsi
8	D. J. Garde	Khandesh
9	R. T. Methaji	Kolhapur
10	M. Y. Bhandarkar	Poona
11	K. K. Khambata	Khandesh
12	D. M. Patil	Gadag
13	Narona	Bombay (Dairy)
14	S. D. Nagpurkar	Poona City
15	M. H. Desai	Jalalpur Tal. Dev A
16	M. M. Mehta	Do. Borsad
17	S. H. Vora	Kalol
	BUSINESS ON THEIR OWN ACCOUNT.	
1	P. J. Dhandura	Bombay
2	S. V. Shirgaonkar	Belgaum
3	V. R. Gadgil	Poona City
4	R. P. Kanhere	Ahmadbad
	WORKING IN BUSINESS FOR OTHERS.	
1	D. D. Panjabi	Karachi
2	R. G. Padhye	Belapur
3	S. M. Patel	Bombay Polson Co.
4	H. Ezekiel	Plaghar Dairy Bombay
5	Khot	District Belgaum
6	S. P. Ichal	Kolhapur
7	J. D. Edalbehram	Shaughai Ohima
8	L. G. Kulkarni	Kirloskar Wadi

OUR SOCIAL GATHERING.

———:O:———

The Social Gathering of this year was conducted on the 11th and 12th of August. We had the rare privilege and honour of the presence of Hon. Mr. Pradhan, Minister of Agriculture and Excise as the President of the function. Dr. Mann, Director of Agriculture and some time Principal of this College, and a good number of the old boys and well-wishers of this institution were also present to make the whole business more interesting.

The sports were conducted on the 11th and 12th and our competitors acquitted themselves creditably in all the items. The whole College was full of life and vigour and the dramas acted by the students were much appreciated by the audience.

At 4 O' clock the meeting began with the Minister in the chair. The Principal welcomed the President and the guests and the following is the extract from his welcome address.

Hon'ble Mr. Pradhan, Ladies and Gentlemen.

On behalf of my colleagues and the students of the college of Agriculture I welcome you very heartily. Many of the staff including myself are the old students of this institution and we therefore feel proud to be here to welcome you. Dr. Mann the first Principal of this college and the man who laid the real foundation of public service in this institution used to say that he would be proud to see the college staffed from bottom to the top by the students of this Institution. I am sure he must be feeling happy today to be amongst us to see our work.

It is the happy lot of this college to have among us during the last two and half years distinguished guests like

H. E. the Viceroy of India.
H. E. the Governor of Bombay.
Honble Mr. Srinivas Sastri.
The Members of the Royal Commission on Agriculture

and this afternoon we have the Hon'ble Minister in charge of Agriculture among us to give his valued advice.

Perhaps the Hon'ble Minister might be suspecting me to say something of our immediate *needs* and of the nature of work we are doing.

I don't think I should worry him today by asking more facilities and larger grants. I like him to come here some time and study these.

Our wants are many, the most urgent one being the extension of the College. It is at present before the Government and I am sure, Sir, that you will consider the question of the extension of the College and Development of the Research work very favourably.

Sir, persons with University qualifications, keenly interested in the welfare of the people but less acquainted with the nature of Research work, often think that Agricultural Colleges in India are liberally staffed. I may submit, Sir, that for the nature of work namely Teaching and Research, such Institutions in India are understaffed and poorly equipped. At any rate it is so here with us in the Bombay Presidency.

As compared to the Agriculture Departments in Europe, America and even in Japan and Java *ours* is an understaffed Institution. I can say this with personal knowledge.

I can however with some confidence say that although we are understaffed and poorly equipped our work is not *deficient* either in quality or in quantity and I think we are serving the country as efficiently as any Agriculture Department in the world and that is why our college is drawing pupils from all Provinces in India and even from out side India.

In fact, much against our will, we are obliged to refuse admission to hundreds of qualified students because we cannot accomodate larger number. Of all the Agriculture Colleges in India ours only has come to the stage of opening a graduate school on the lines of those opened in some of the important universities in the U. S. A. and I hope a day will come when we will be able to give post graduate courses in all branches of Agriculture not only to the students in the Presidency but to those who will surely come from other Provinces.

I will now call upon Mr. Bhave the General Secretary of the social Gathering to read his welcome speech on behalf of the students."

The General Secretary of the Gathering, Mr. Bhave, then read his report and he alluded in it to some of the wants of the College, such as the extension of Hostel accomodation, the absence of a suitable play ground and the installation of Electricity. We have been requesting the authorities time and again for these things; but our requests have been a cry in the wilderness. We dare to hope that in the present instance our cries have not fallen on deaf ears.

After the distribution of prizes the President addressed the gathering. He said that, though he was told of the want of Hostle

accomodation, of the sad necessity of refusing admission to the College to many applicants and so on, nothing could be done at present with a depleted treasury and the Gujarat Calamity which would necessitate an additional expenditure on the part of the Government. He was at the same time kind enough to promise a visit to the College in his leisure time to study our wants personally. The Minister was of opinion that a country which was mainly agricultural was to be preferred to a country that was mainly industrial. Since India is mainly an agricultural country, he said that the students of the Agricultural College must play a great part in the country's welfare. He requested the students to convey the knowledge they have gained here to the poor ryots for better cultivation instead of hunting after Govt. Service; by this the students would do a great deal to increase the material wealth of the mother country. By this they would be doing an immense service to India. He deplored the excessive subdivision and fragmentation of holdings which stood in the way of prosperous agriculture and spoke at length on the Bill to be brought in the legislative council to prevent this. The President then advised the students on the duties of a citizen such as standing by his motherland, obeying the laws of the country and seeing that others also obey them, voluntary service, interest in politics and tolerance of other's views. Here he referred to the feuds between the Hindus and Mahomedans and pointed out that they could be prevented if the virtue of tolerance was cultivated more and more.

Then Prof. Gokhale proposed a vote of thanks to the President and other guests of the evening. Particularly he mentioned the names of the chief of Ichalkaranji who evinced a great deal of interest in Agricultural Development and of Dr. Mann Director of Agriculture. Prof. Gokhale said that it might be the last time for Dr. Mann to attend the college-gathering as a member of the Department. But may be present or not, he will be always remembered by the work done by him and by the lessons he has taught us. The most important of them, he said was the "spirit of service".

At this stage Dr. Mann was proposed for a speech and accepting the request Dr. Mann made a short but thrilling and inspiring speech and inculcated on the minds of the students the principle of "spirit of service" and said that if he left India, he would be back again either in spirit or in body and be watching with interest the Progress of this College.

After garlanding the President and the principal guests the meeting terminated amidst cheers. N. S. M.

OUR COLLEGE SPORTS.

Our College Sports this year have been a sport in the real sense. Almost every one took part in some item or other and thus made the function a grand success. The het rogeneous mass of competitors inc'uding the tender, the young, and the o'd—from budding boys of five, right up to the Honble Minister of Agriculture—was indeed a rare sight to be seen. Rao Bahadur P. C. Patils play in gymnastics was a sport in it-elf We are specially thankful to the members of the staff for having taken part in sports this year. All honour to the competitors ! Three cheers to the prize winners and to Mr. Irani the General Champion !!

The following is the list of prize winners.

LIST OF PRIZEWINNERS, COLLEG SPORTS 1927.

		First Prize.	II Prize.
1	100 yards flat race	B. A. Irani	De souza.
2	220 ,, ,,	B. A. Irani	De souza.
3	440 ,, ,,	B. A. Irani	De souza.
4	One mile Race	Jayasekar	R. B. Patil
5	Cross Country Race	K. G. Lymae	S. B. Pandya
6	120 yards Hurdles	V. T. Gadre	B. A. Irani
7	Hill Climbing	Motafram	Guzdar
8	Gymnastics	S. Madhave Rao	Marwadi
	Exhibition prize	R. B. P. C. Patil	
	Consolation prize	R A. Irani	
9	Malkhamb	K. G. Lymae	Marwadi
10	Putting the shot	B. A. Irani	R. A. Irani
11	Obstacle race	V. T. Gadre	B. A. Irani
12	Long Jump	B. A. Irani	Kanagasabai
13	High Jump	Kanagasabai	B. A. Irani
14	Fast walking	B. A. Irani	S. B. Pandya
15	Fast Cycling	Motafram	P. A. Modak
16	Slow Cycling	B. A. Irani	A. Mir
17	Potato Picking	P. M. K. Menon	B. A. Irani
18	Memory Race	D. G. Desai D. K. Makhijani	
19	Throwing the Cricket	S. D. Dongre	Guzdar
20	Chatty breaking	D. G. Desai	

21 Pole Jump	Marwadi	M. O. Menon
22 Hopping on one leg	S. D Dongre	M. O. Menon
23 Bad minton (Doubles)	Menon & Nazarath	Sirur & Desphande
24 Ping Pong	F. R. Metha	G. S. Phadnis
Sp. prize for Best batting in the recent Int. Collegiate Cricket, by S. N. Changule	W. N. Ghorpade	
25 Putting on Donkey's tail	V. K. Bedarkar	Ramachandra
26 Prof. L. B. Kulkarni's Ecology Prize essay	I A. Syed	
27 General champion medal and Cup	B A. Irani	
28 Special prize for best athletic by S. M. Vakil	B. A Irani	
29 Wresting heavy weight	M G. Patil	Vipat
" light weight	Vipat	Dave
30 Farm boy's race	S. G. Sathe (above 9 years) S. S. Teli (below 9 years)	
Special prize by Prof. Kulkarni	R. K. Kulkarni R. Salpute	
Special prize by R. A. Irani	Master Desai	
31 Tug of War	Senior B Ag. Team	

STAFF SPORTS.

I Ring and Board	Prof. Trivedi	
II Chatty Breaking	K. R. Patil	V. G. Deshpande
Consolation prize	Rao Bahadur Patil	
III Student X Staff Tug of war Challenge Cup	Staff.	

S. MADHAVRAO

Sports Secretary

COLLEGE NEWS AND NOTES.

The most interesting function in August was the Social Gathering, an account of which appears elsewhere in this issue. We tender our heartfelt thanks to all those who honoured us with their presence and made everything a success. Our hearty congratulations to all the prize winners in the sports, especially to Mr. B. A. Irani, the College Champion.

We are glad to welcome back Rao Bahadur Patil, Ag. Principal, who had gone on leave for a few months.

Mr. D. B. Hanmar, B. Ag. Demonstrator in Ag. Engineering was transferred to Baramati as D. A. O. Our best wishes go with him. Mr. P. J. Patel who passed the B. Ag. Examination last year is appointed in his place.

This year the Debating Society has conducted two or three meetings on topics important to students of Agriculture. Prof. Mahajani's lecture on 'Unemployment' is specially interesting to Agricultural students because the future hope of India rests with them. Among the remedies suggested by the Professor are Industrial Development, Birth Control, and allowing students to appear once or only a limited number of times for any examination. We cant say how far these will be carried out in practice; but the unemployment problem has assumed serious proportions.

Mr. Bhopatkar's lecture on 'Rural Reconstruction' also more or less concerns those interested in Agriculture. He advocates Agricultural development in the villages, compulsary Primary education and Cooperation, and complete prohibition of Drink among the rural people. Another thing to be remedied according to him is the Deccan Agriculturist's Relief Act. Quite a good number of students also displayed their interest in the problem. Example is better than precept and we request these energetic speakers to put into practice what they preach since this lip-sympathy evinced by feeble speeches in closed up rooms will not do an atom of good to the country.

Though late (not our fault) we can't help saying a few words about the recent flood in Gujrat. The great damage done is known to all from newspapers. We tender our heartfelt sympathy to the sufferers and request every body to contribute what he can to alleviate their misery. All crops are washed away and it is our

pride to note that the officers of the Agricultural Department leaving no stone unturned to bring everything to normal condition. Last year the whole area was devastated by locusts and this year by the foods. We ardently hope that Nature's Cruelty will be some what balanced by man's bounty.

GYMKHANA NOTES.

The main activity in this season is Cricket and it is our pride to note that our players have risen to the occasion. The first round was played with the Deccan College and the second with the Engineering College. In both of these we came out successful and for the finals we have to meet the New Poona College. We hope that with our good players we will be able to obtain an easy victory.

The other items too in the Inter Collegiate sports are going on and in some of the events our competitors have returned with flying colours. Below we publish a list of them. The other items are still going on and the result remains to be seen. Any way we have every hope that Our College will not lag behind its Sister Institutions. We request all our competitors to gird up their loins and bring glory to this institution.

In the Inter Collegiate Volley Ball Match we defeated the Fergusson College in the First Round and the Law College in the Second Round. In Basket Ball also we defeated the Fergusson College in the first Round and we have to meet he Deccan College for the Finals In Tug of War we have twon against the Deccan and Fergusson Colleges and come to the Finals.

The various sections of the Gymkhana are working in full vigour. The Reading Room has been made more attractive. We request all the students to assist the Hon. Secretary for the Reading Room in all matters so that each and every one of us can reap benefit from it.

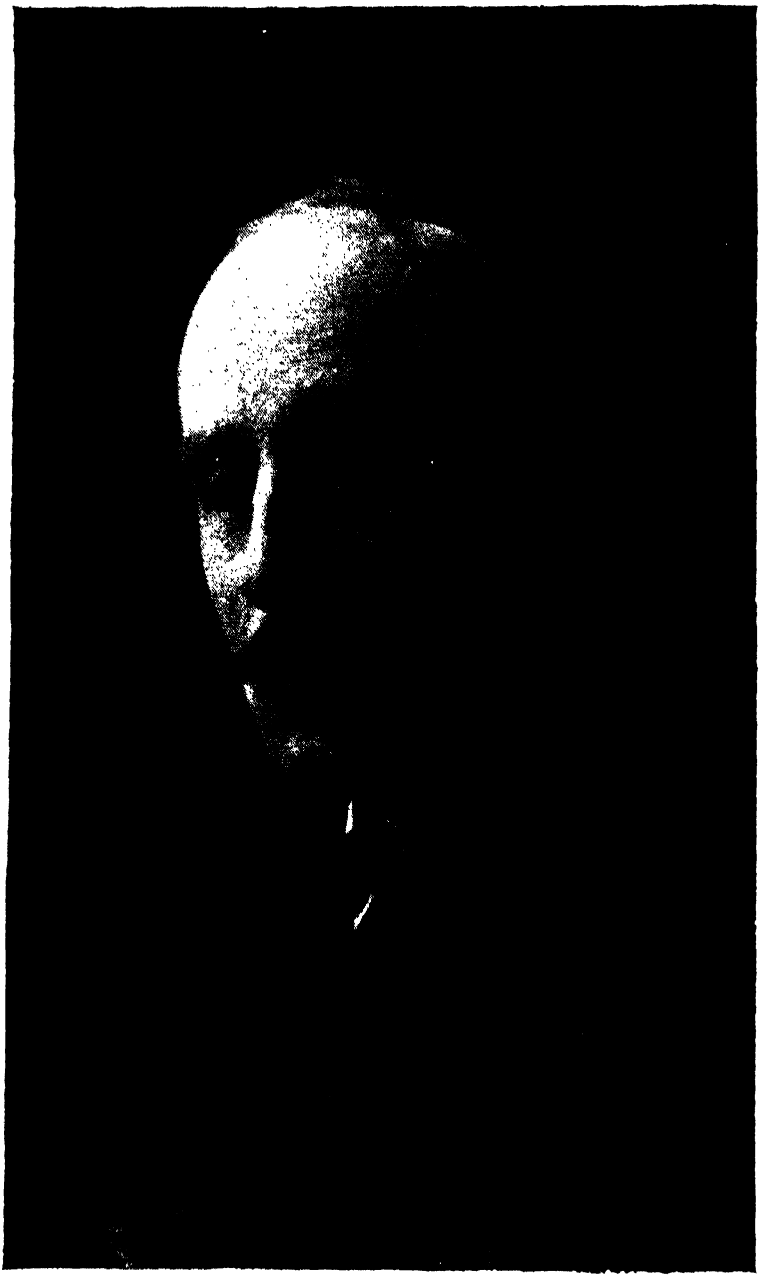
Result of Inter Collegiate Sports till 24th August.

Fast walking	Second
Putting the Shot	First
Relay Race	Winners

The full list with the names of the competitors will appear in the next issue by which time the sports will be over.

B. ISHWARLAL

Hon. Gen. Secretary of Gymkhana.



Dr. Harold H. Mann, D. Sc.

Photo by:—
[ELLIOT FRY.]

THE POONA

AGRICULTURAL COLLEGE MAGAZINE.

VOL. XIX.] DECEMBER 1927. [No. 3.

EDITORIAL NOTES.

Dr. Mann's retirement.

The important event that took place since the publication of the last issue of our magazine was the retirement of Dr. Harold. H. Mann, D. Sc. Director of Agriculture B. P. on 16th of October Last. He had the honour of being the first Principal of our College and this magazine was started in his regime. Being a very capable man, like an expert gardener he nurtured the infant institution, we-mean-the college-with care and tact that it soon developed into a full-grown form. In fact it is no exaggeration to say that the present development and popularity of the college is all due to him. Having been appointed as Director of Agriculture since 1921 he had less connection with the college, still he was all the while watchful about the progress of this institution. He was a man of public activities which were so varied and numerous that it would not be possible in this column to do justice to them all and we beg to refer our readers to his life sketch described elsewhere in this number. Looking to the numerous addresses and fare-well parties given to him by officials, non-officials and public bodies it will be clearly evinced in what high estem he was held by the people. our college also gave him a grand Farwell party in which all the students and staff took part. Principal Patil made a short but pithy speech and presented him with an Album containing Photos of the Staff of all the sections of the college and the College buildings which would surely serve to always keep his memory fresh about the college and its associations. In Dr. Mann the Bombay Department of Agriculture lost a great scientist and agriculturist and the presidency a great public worker.

* * * *

Village survey.

In "who is who" in science in giving Dr. Mann's life-sketch, it is written that his recreation was study of sociology. In fact he was the pioneer to start the survey of villages to investigate into the economic and social conditions prevalent there and with a view to suggest measures for their amelioration. His lines of work have been taken up by other workers in the field and even adopted by men in other provinces. One of such studies made by one Mr. Ranade, V. G. of the Konkan Education Society and published by the Provincial Co-operative Institute, Bombay, has been received by us for review. Mr. Ranade has more or less followed the lines of Dr. Mann and the conclusions arrived at by him about the village under study agree in general with those drawn by Dr. Mann. The detailed review of the book will be published later as the space will permit, but among the many other causes ascribed for poverty to which the villages are reduced, excessive fragmentation of land which consequently leads to formation of un-economic holdings has been agreed upon by all as the greatest evil and obstacle in the economic cultivation of land.

* * * *

Bill to prevent excessive fragmentation of land.

To remedy this general and serious complaint which is stifling with the Agricultural Progress, the Bombay Government have recently introduced a Bill in the Council for prevention of excessive fragmentation of holdings and their subsequent consolidation. After the first reading it has been referred to a select committee for consideration till June next. Though it is admitted on all hands that it is one of the greatest evils, looking to the opinions expressed by the members in the Council and to the criticism by the general public in papers, it appears that any how the bill is not finding favour with the public. No doubt it is a thorny and very complicated question and it is very difficult to forecast the far-reaching effects of this bill if it is passed once-for all, into a statute.

There are two separate issues in this bill. As regards the first part we dare say that there cannot be two opinions that the excessive parcelling out of lands has reached such a pitch that time has come to cry halt any further subdivision. The latter part-consolidation of holdings-is the most important, but really the most difficult part on which agreement will not be easily reached.

At any rate it is absolutely necessary to study the question thoroughly, and it is in this connection that we suggest to the Bom-

bay Agricultural Graduates' association that it is up to them to take up the question and by appointing a small committee of their experienced members, to publish a small leaflet describing in detail the whole situation, the pros and cons of the question and also the after-effects if the bill is passed. This small pamphlet may also be published in Newspapers so that it will be useful in educating the public as well. If there be even distant danger in passing the bill it should be clearly brought to the forefront, but at the same time if it is conducive to the ultimate good of the people, that may also be clearly explained. If they will not rise up to the occasion, they will be failing in their duty.

* * * *

Royal Commission.

The Royal Commission on Agriculture, after finishing the work in England, has come back in October last and begun work earnestly in Sind, Burma and other places. Its report is shortly expected. The problems before the commission are however so vast and compli cated that it will have a very hard time to arrive at satisfactory conclusions. We only hope the recommendations of the commission will mark a distinct era in the history of Agriculture of this country and go a great way in providing solutions to the many complicated questions that are confronting the economists.

* * * *

Agriculturist Talks.

The Indian Broad-casting company, Bombay, has got on its programme among many other things a series of Agricultural talks for Broad-casting. These Agricultural talks are delivered by competent men and contain in popular language the salient features about the subject. Thinking that some of these talks would in general interest the readers of this magazine we requested the Joint-Director of Agriculture to forward them and permit us to print the same, which he kindly did after consulting the I. B. Company. We are thankful to Dr. W. Burns and the I. B. Company.

THE ART OF PLANT BREEDING.

BY

DR. W. BURNS

Joint Director of Agriculture, Bombay Presidency. July 30, 1927.
(With the kind permission of Indian Broad-Casting Company Ltd)

I do not this evening propose to give you a dry list of facts, such as for example the oft-repeated statement that 71 ½ per cent of India's population is engaged in agriculture. I shall instead say a word or two regarding the art of plant breeding, an art of great agricultural significance and international importance.

In prehistoric times it is probable that man was first a hunter and later a farmer. No sooner did he take to agriculture than he must of necessity have become a plant breeder. Early agriculture was probably merely the collection of seeds of certain wild plants and sowing these in one place. In choosing the wild plants and in the repeated sowing of these seeds, man unconsciously exercised a selection which gradually altered the character of these plants. Our main cereal crops now differ widely from their wild ancestors, and in some cases the wild ancestors are entirely unknown.

The modern art of plant breeding began in the first half of the nineteenth century, with farmers, not scientifically trained, who by their own observation and reflection were able to seize on individual plants in their own crops that showed promise, multiply the seed of these and so found new strains of great value. Such a one was Le Couteur in Jersey, Patrick Shirreff in Scotland and Hallett in England.

A very important development was the founding at Svalof in Sweden in the year 1887 of a company financed by farmers to produce improved seed grains. This company has not only produced some extraordinarily valuable strains of crops but has also been served by some of the most illustrious scientists in this branch of knowledge.

Plant Breeding, however, received its greatest stimulus in 1900 by the re-discovery of work done several years before by an Austrian priest, Gregor Johann Mendel, and published by him in a local scientific magazine in 1866. Mendel, in his spare time, did some interesting work in crossing different varieties of peas and in studying the behaviour of their offspring. In this classic work he narrowed down his problem in a way which is an example to all scientific workers. Too often a research is spoiled by the problem proposed being vague and complex. Mendel studied what happened when he crossed varieties of peas differing in one character only, for example in the colour of the seed. Later he went on to varieties differing in two characters. From these experiments he developed a theory of astonishing significance.

The reason why these results and this theory were not immediately seized upon by the scientific world in general is a little difficult to explain. It may have been partly because his results were published in a comparatively unimportant journal. It may have been because the whole world was then discussing Darwin's Origin of Species. But even if these reasons are real, it was more probably because, like many another workers in Science, Mendel was ahead of his time.

However that may be, his work has received its reward now. Its value lies in the fact that it affords the breeder a key to the previously incomprehensible behaviour of the offspring of hybrid plants. Since the day of the rediscovery of his work much more has been done in continuation of it, and there is not a single civilised country that has not contributed at least one famous scientist to the advancement of this branch of science and indirectly of agriculure.

The original theory of Mendel has been amplified and amended. The fact that it does NOT explain many cases has also been determined; but it has been, as I said before, the most tremendous stimulus that the science and art of plant breeding have received.

I may now say a word as to the applications of this science and art in the Bombay Presidency.

In the case of cotton, whose importance as a crop in this province is second to none, the plant breeders of the Department of Agriculture have been able in all cotton areas to produce types markedly superior to those previously grown. These improved types have been selected out of the ordinary crops of the cultivator.

Most cultivated crops in this country are mixed populations containing good, bad and indifferent. A trained plant breeder recognises, isolates, tests, multiplies and finally distributes the good strains. Some of these good strains occupy an astonishing area. In the case of our best Gujarat cotton variety it is estimated that at least half a million acres are under this type, and it was estimated in 1925 that the growing of this type meant an addition of about 30 laks annually to the amount that would have been received if the cotton crop had remained of the kind it was in 1919.

In the Southern Maratha Country we have been equally successful with two splendid types of cotton. In the rice growing areas centred on Karjat we have now got over 10,000 acres under an improved rice produced by us, which gives a yield 20 per cent higher than the crop it replaces In tobacco we have just isolated and are distributing a markedly improved variety. Work is going on in jowar, bajri, the inferior millets and castor seed. In all these efforts success is certain because of the method which exact pure scientific research has put in our hands

Our aim is in all cases to increase the yield, that is to ensure that from every acre there shall be an increased weight of the product. But that is not the only aim. There are questions of quality also. In cotton for example we aim at lengthening the hairs, at increasing the ginning percentage, and at developing disease resistance. In the case of cereals there are the colour, fineness and milling character to be considered. In tobacco quality is of very great importance. Improvement of quality is however not quite so easily measured as improvement of quantity, but even that requires special methods of measurement.

It may interest you to know that on the 20th of this month the plant breeders of the Department of Agiculture met in Poona and discussed as their main subject the method of determining exactly the amount of quantitative improvement obtained in any given crop. It may appear to be an easy thing to determine such improvement, but in practice it is by no means easy as you will understand when you think of the differences of soil, climate, and cultivation that have to be allowed for. In this matter we again stumble on the one of the characteristics of modern problems, namely that they need the co-operation of several sciences for their solution. In determining the amount of improvement in any given crop we have to call in the help of that branch of mathematics which deals with statistics and with probability. Only so can we be sure of our results

All these crops that I have just mentioned are propagated by seeds. We encounter a different and in some respects a more easy problem when we deal with plants that are propagated by grafts, buds or cuttings such as fruit trees and roses. If in the case of a plant propagated by seed you happen to be dealing with a hybrid, it may take you some years to make sure that you have got a strain with a fixed character. But in the case of a plant not usually propagated by s ed, even if you have got a hybrid, it will remain true from the start if you propagate it by grafts or cutting or buds.

This fact you can make use of in your own gardens if you want to multiply some specially fine rose, some brilliantly coloured croton or some specially good brand of orange or pomelo.

I trust I have not tired you with this talk.

My aim has been to give you some small idea of what has been achieved and also to let you see, even if dimly, the immense background of international scientific work that lies behind this advance in practical agriculture.

There is no secrecy and there are no pate t right in such scientific work, and all the world reaps the benefit of it.

THE REALITIES AND POSSIBILITIES OF FRUIT GROWING IN THE BOMBAY PRESIDENCY.

BY

MR. H. P. PARANJPYE.

(*With the kind permission of Indian Broad Casting Company Ltd.*)

‘Eat more fruit’ is the slogan of the modern doctors, and they are right. Fruit is a natural gift to man. It contains large quantities of vitamins and it has nourishing, digestive and laxative properties. It is for this reason that fruit enters so largely in the food of the people of Western Countries. In Europe and America, a considerable area is devoted to fruit crops of various kinds. Thus France has 1 acre under fruit for every ten persons. The U. S. A. claim 1 acre for 16 persons, and in Germany there is one

acre for 56 persons but in India 450 persons depend upon one acre for their supply of fruit. It will be seen that India is far behind other countries in the matter of fruit production and consequently in the use of fruit as an article of diet. With all our best efforts, we find that during the last fifteen years there is only an increase of about one thousand acres per year under fruit in the Bombay Presidency. The population of B. P. is 2,67,01,148 souls for whom the present supply of Bombay fruits is most inadequate.

In the Presidency there are certain areas where practically no fruit crops are grown; for instance, Gujarath mostly depends for a supply of fresh fruit on other districts. Guavas, Pomegranates, *Bors* and mangoes are grown on a small scale. Oranges and grapes and figs are not grown. Similarly in the Karnatak also there is very little attempt to grow fruit trees except mangoes and lemons. In the Konkan mangoes and Jack fruits and bananas are the principal fruits grown. A close study of the habits and nature of the fruit trees seen in the Presidency clearly shows that most of the soils commonly found in the Presidency are suited for one kind of fruit tree or another. The land at present left unoccupied by any kind of tree can be very usefully used for some kind of vegetation either for fruit or shade or timber. The essential point is a genuine love of trees and plants and aptitude to work with one's own hands.

If you are interested in growing fruit trees you may consult the Horticulturist to Government, College of Agriculture, Poona, who will give you proper advice in the matter but in the meantime I may tell you that there is vast scope for proper utilization of unoccupied lands; and the possibility of growing mango trees, *bor*, *Jambhul*, *Kaju*, or some useful trees like the teak, sandalwood tree, *Ain*, *Kingal Hirda* etc is very great. In Gujarat people have now-a-days taken a fancy for *Bor* cultivation and they are rightly converting wild and useless Bor trees into superior varieties by budding with the help of the Agricultural Department. This costs them practically nothing and gives them reasonable profit from trees which are no good or in certain cases distinctly harmful both to man and beast.

Many people are deterred from planting fruit trees because they cannot wait for a number of years for realisation of their capital and interest. Different fruit trees come to bearing age at different times according to their kind and nature. Bananas and Papayas begin to yield fruit in a year; *Bors*, grapes and figs begin

to yield fruit in two or three years; pomegranates and guavas are productive in about four years. Mosambis yield fruit in five years. Mango trees are the slowest to produce their first fruit. The intending fruit grower would do well to remember that the early appearance of the first crop of fruit trees he has planted depends mostly upon the care bestowed upon the trees. Mango trees, for instance, are seen to produce good fruit in the sixth year under careful management but in certain other cases they have remained completely barren for over fifteen years. In fact fruit trees always respond to the care and attention bestowed upon them.

Certain people consider that the establishment of a fruit garden is a very expensive business. I shall give you an idea of the money required to purchase seeds or nursery plants It is a sound policy to purchase the best and most reliable seed of papaya or save it from best types of fruits which you occasionally find in the market Seed is usually sold at 6 to 8 annas an ounce. About three ounces of seed is quite sufficient for one acre. Seedlings should be raised in the garden itself. Nursery plants of fig, pomegranate, guava, and custard apple are sold from Rs. 10 to Rs. 15-per 100; and about two hundred plants are required to cover an acre of land. Good mosambi plants are sold at Rs. 35-per 100; unrooted grape cuttings are sold at a nominal price of. Rs 10-per 1000.

Good mango grafts are sold at Rs. 2-8-0 to Rs. 3-each and Chickoo plants are sold at Rs. 5-to Rs. 6-each. The rates do not include packing and freight charges which vary accordingly to the distance.

The land required for most of the fruit trees should not be of a heavy nature except for mango. In the Deccan the soil should be of medium depth between two and three feet with a substratum of *murum*. In any case the soil must be well drained; and should not be influenced by any irrigated crop nearby or by canals. The land should be very nicely worked before the trees are planted in their permanent places. This first careful tillage of the land is amply repaid afterwards in the vigorous growth of plants. Most of the fruit trees allow cultivation of some subsidiary crop in the intervening space between the trees during the first two or three years. These crops meet the running expenses of the garden.

Fruit trees require water throughout the year in their early age at 8-12 days' interval according to soil condition. In the Deccan where facilities for canal irrigation exist, people object to

2

the use of canal water which, according to their opinion, is harmful to fruit trees. There is, however, nothing wrong with canal water itself. The defect lies in the method of applying the water. When the water-cess is levied according to the *area* irrigated and not according to the amount of *water used*, the alleged fault in canal water is bound to exist. We have seen in Government Gardens that canal water as such does no harm to fruit trees and that it may be safely used for fruit trees.

This water costs Rs. 33 per acre. Well water drawn by bullock power is very costly.

Along with the above general remarks I may give you an idea as to the probable income. It is common knowledge that mango trees usually do not bear fruit every year and it is also equally true of other kinds of fruit trees in a less degree. A heavy crop is usually follwed by a light crop. In certain types of fruits, a crop may altogether fail. The fruit grower should therefor be prepared for such a contingency which may occur once in five years. Taking into consideration all these lean years and fat years we may safely take Rs. 150 to Rs. 200 as the net return per acre. This margin of profit will increase or decrease according to the capacity of the owner and the locality of the garden.

The mango is a tree which can be very profitably cultivated in many places. Preferably high class varieties such as Alphonso and Pairi should be grown; but if that is not possible country mango trees of reputed kinds may be grown. These fruits also have a considerable demand both in town and in country.

The next popular crops are oranges, grapes and figs if there is sufficient supply of sweet water. In fact these crops would be very valuable additions to Gujarat crops. Nasik is practically the only district which supplies grapes to other parts of the Presidency except Sind, and there is considerable scope for extension of this crop in other parts of the Presidency, particularly in Khandesh, Ahmednagar, Sholapur, Satara, and Bijapur. Recently a few grape gardens established in Baramati have awakened a keen interest in this crop among the land-owners. The reason why this crop is becoming popular is that it comes to bearing age within two years. Diseases are few and easily controllable.

This leads us to the question of diseases and pests of fruit crops to which I may refer briefly. There are certain crops which

are invariably attacked by diseases and pests. But practical study and experiment by the Agricultural Department have revealed the fact that most of the diseases and pests of fruit trees are readily amenable to treatment. For instance mildew of grape vine can be effectively controlled by timely spraying with Bordeaux mixture, or by sulphur dusting. The *Anar* caterpillar of pomegranates can be prevented by bagging of flowers; the *mashi* or orange moth can be prevented by catching it at night time. The gum disease of Citrus trees can be completely cured by crude carbolic acid.

Many people are afraid that in certain seasons markets are glutted and fruits do not fetch adequate prices for the grower. This happens sometimes. This is due to the fact that there is no organised agency to distribute the produce over a wide area and to send the produce where there is a demand. A side question arises out of this point. How much area should a grower devote to fruit crops? This can be answered by another question. What should be the magnitude of any man's business concern? It depends upon the capital available, upon the business tact, upon the capacity to attract customers and so on. Similarly the area under fruit will depend upon the grower's capacity to grow the fruit successfully and to sell it in the market profitably. The best way would be to begin this first on a modest scale and as you get experience and insight into the business, increase your cultivation.

The fruits can be presented in the market in a durable form. It is almost common knowledge that at Bassein, certain types of banana are dried for commercial purposes and people commonly believe that bananas cannot be dried except at Bassein. Experiments have clearly proved that almost every variety of banana can be dried and suitably packed for commercial purposes.

Lemons are grown practically all over the Presidency and the fruit is ready in the rainy season when the price goes very low. In the last Presidency Agricultural Show at Poona, thousands of people have daily witnessed how easy it is to bottle lemon juice which can be used in the season when lemons are sold at a very high rate. Not only that, the business can be started on a factory scale at suitable centres where lemons are grown on a large scale.

In Kanara and other remote places which are not easily accessible either by rail or by steamer, large quantities of fruit find no market. Here also mango pulp can be readily canned. There are at present two factories working in the Kanara District and their

product is very readily sold. The product finds a ready market in countries to which Indians have emigrated.

Indeed a large number of fruits grown in the Presidency can be preserved in one form or another. Large quantities of Jambhul, Kaju, Karwand, and Guava, almost always go to waste every year and these are awaiting the advent of an enterprising manufacturer.

Lastly I may draw your atention to the question of grading the fruit products offered for sale in the market. The product may be either fresh or canned. It must be in a perfectly uniform, clean and presentable appearance. The packer at present keeps inferior fruit at the bottom and good fruit on the top. The middleman is never misled by this device; he knows by experience that the bottom fruit is always far inferior to the top fruit. He therefore, pays according to the quality of the lower grade of fruit. The grower loses considerably. The consumer cannot depend upon the quality of the fruit packed in a single consignment. He gets good, indifferent and bad fruits when he purchases a basket of fruits; he is therefore not ready to pay as much as he should pay. In fact standardisation of brands in the case of fruit and fruit products is a great desideratum in India.

NOTE ON "SOAP-NUT" TREE.

BY

M. R. GOKARN Esq. B. Ag.

(*Agricultural Overseer Kanara.*)

:o:

Arboriculture or planting of trees of economic and commercial importance has received scanty attention of the educated public, perhaps being considered as beyond the scope and means of the individual persons and only to be looked after by the public bodies as the P. W. D. and Local Boards and Municipalties. There are vast areas of waste lands under various descriptions of soils, climate, rainfall and other natural conditions round about rural areas in Western India, which can be developed on systematic lines from all the points of sanitation, aesthetics and practical economy.

The list below furnishes some of the useful trees of importance to the agriculturists.

No.	Name of tree.	Nature of tract.	Useful product.
1	Soapnut	Heavy rainfall	Soapnut fruit
2	Tamarind	Light rainfall	Fruit
3	Jack	Heavy rainfall	Fruit and timber
4	Jambul	Do.	Do.
5	Undi	Do. coast	Fruit and oil
6	Cashewnut	Do. coast	Edible fruit and nuts
7	Karanj	Light rainfall	Pods for oil, leaf-manure
8	Nim	Do.	Fruit for oil Cake for manure, timber.
9	Mango	Heavy rainfall (general)	Fruit and timber
10	Raintree	Do.	Pods as cattle food, leaves for fodder and manure.

Out of these, the importance of soap-nut tree, the fruit of which was once a common house-hold commodity in place of soap, is described in the present note.

Soap-Nut (*Reeta-Sapandis trifoliatus*)--is a large tree with a much branched spreading crown, growing 60 to 80 feet high with girth as thick as 8 feet when full developed with a life of 80-100 years. Talbot's flora Vol I gives the following description. " It is an ever green tree with a much branched spreading crown, bark grey, shining, with rough scales, wood hard yellow heavy not durable and cracks on exposure. Leaves rough and leathery, trifoliate leaflets elliptic or obtuse emarginate 3″ to 7″; fruit-drupe 2-3 celled, fleshy largely used as a substitute for soap to which it is preferred for silk and flannel. Root, bark and fruit are used in native medicine. A semi-soid oil is extracted from the seed."

The tree is found distributed along the western ghats from Konkan southwards in ever green monsoon forests, Southern India and Ceylon, but nowhere common as regularly planted. The fallen seed is allowed to grow in the house compound, and there is no

prejudice for retaining the plant growth. It is said to improve sanitation. The soap-nut tree as found in Kanara is distinctly a deciduous one though Talbot classifies it under the "ever green." The tree grows upto 80 feet with a thick girth 6–8 feet in heavy loamy soils as in the up-ghats; but in sandy soils, the growth is restricted to 40–50 feet height with wide branching and 4–6 feet girth.

Flowering commences in October–December, and fruits ripen in January–March, the season is of course earlier on the coastal belt. Soon after the fruiting season, the leaves drop down completely for month or so; after which fresh foliage is developed pale green in colour throughout the rest of the year.

Soil rainfall etc:—The tree is found on the sandy Kanara coast with 85 to 150" of rainfall, as well as on the outskirts among the ever green forests of Sirsi and Siddapur, rich reddish clay loam containing abundant humus. The tree will be satisfied with a poor quality of soil-murum soil unfit for good timber trees, can be found useful. Luxuriant leafy growth is not conducive to maximum yield from the tree. Rain-fall less than 45" may not be suitable as indicated by the scarcity of such trees in Mundgod-Halyal.

Propagation:—Propagation of this tree is very simple. Best results are obtained where the seed is dibbled "in situ". Seed has good vitality with 85 to 90 percent germination even when neglectfully thrown near the country bathing sheds. Young trees are not eaten by cattle or deer. Planted 24 ft x 24 ft, an acre would hold 75 trees. A small quantity of manure may be applied in the pits particularly in poor soils. In about 10 years the tree will begin to flower and will bear a full crop from the 15th year onwards. In order to give maximum yield, it should be trained to grow into as widely spreading crown as possible, the tendency to grow lanky being broken by pruning the top bud when, 8 to 10 feet high from the ground in the young stage i. e. when about 4 years old. By judicious and timely pruning, the crown may be made to spread out more and more as it spreads.

Collection of fruits:—A single tree when in prime of life i. e. after 15 to 20 years, yields one to two bags of ripe fruit. One bag contains 3½ to 4 mds i. e. 100 to 112 lbs valued at Rs. 1-8-0 to Rs. 2 per maund. Even at the lowest estimate taking into consideration the long life of the tree, at ½ bag outturn annually with allowance for lean seasons, the tree would yield Rs. 3 each i. e.

200 Rs. per acre. This figure should set us thinking why one should not have a regular plantation of this valuable tree.

Some of the actual yields obtained during the season are given below:—

	Place	Description of tree	Soil	Yield in nuts.
I	Karwar	Tree 25 years old, 3ft girth, 25 ft. height.	Sandy	112 lbs.
II	Do.	Age 35 years, 5 ft girth 35 to 40 ft height.	Sandy	224 lbs.
III	Honehalli (Kumta)	Luxuriant growth, 45-50 years, 6 ft girth, 48 ft height.	laterite murum	294 lbs.
IV	Siddapur	45 years, 6-7 ft girth 60 ft height, profuse leafy growth.	red loam	203 lbs.

The season is said to be particularly favourable. On the coast, the fruit is gathered when green before the seeds develop at the stage when less than ¾ ripe in the middle of January. These are dried in the sun for 4–5 days and turned into powder. The powder of leaves of some select shrubs as Hibiscus, acacia, etc. is mixed up with above to give bulk. This powder sells at 3 to 4 annas per lb. The green fruits lose 25 to 30 percent of the weight in the process of drying. The ripe fruits contain greater portion of fibre when developed and hence not fit for preparing the powder. The fruits last for a year or two when stored in earthen pots with narrow mouth.

Economic uses :—In the country where the trees abound, the fruit removed of stone, is held as best substitute for soap particularly for the hair. In every house the ladies preserve sufficient stock for their house-hold being considered to be useful against dandruff (falling of hair) as hair tonic preventive of eczema etc. For the skin as commonly used with fine rice straw. It forms a good stimulant massage with anticeptic properties.

The fruit, bark and root are used in native medicine. Major Kirtikar and Basu in " Indian Medical Plant," Vol. I describe the use of this as under. "Fruit used as hot dry tonic or alexipharmic; 4 grains in wine or *sherbat* cures colic, also used for snake bites; 3–4 grains given by the nose in all kinds of fits causing insensibility. Externally used as plasters for bites of snakes and to

scrofulous swellings. It is supposed to be anthelmatic but that is not really the case. Kernel of the seed is a sweetish nutrient and yields oil on extraction which is a very good substitute for almond oil." Mr. K. M. Nadkarny in his book "Indian plants and drugs" supplements the following information. Soap-nut contains 11'5 of saponim used as an emetic in doses 1–2 drams, as purgative in larger doses. The root has an expectorent property. A watery solution of the drug dropped into nostrils, relieves hysteria and epilepsy. Pessries made of kernel of seed are used to stimulate the uterus to child birth, and in ammenorhea. Most of these medicinal uses are quite known to the people of the villages, particularly relating to hysteria. Though Kirtikar doubts the utility as anthelmatic, the external application of the thick watery solution is a commonly used remedy for massage to relieve the gripping pains of children due to worms. The kernels are daintily eaten by children as substitute for almonds.

The Agricultural Chemist to the Government of Bombay has kindly supplied the following information on the analysis of soap-nut.

	Green nuts dried	Ripe nuts dried.
Woody stone	48 percent	52 percent
Pulp and skin	52 percent	48 percent
Saponim in the whole nut	11'15	13.87 percent
Saponim in pulp and skin	21'44	28'89

The ripe nuts contain 25 percent saponim more than the green ones. The low percentage in the soap-nut as compared to other products as saponaria-bark as a source of saponim, may not give much chance for a cottage industry; but from the various uses to which this product is put to in the country particularly as substitute for soap in the form of powder it may not be impossible to give scope for some plantations to be raised on the waste lands.

Export of the product from Kanara :—In Kanara, the soap-nut is put under minor forest produce, the trees being found widely scattered. No statistics are hence available. Near about Sirsi, there

is a small compact forest area, abounding in soap-nut trees and the produce from this area as well as stray collections from the village of the coast annually exported to Bombay is estimated at 50 to 60 tons. The soap-nut is however freely used in the villages especially among the poor who have not taken to civilised methods.

A NEW GREEN MANURE PLANT.

(*Crotolaria anagyroides*)

BY

V. S. HABBU, B. Ag.

Superintendent Kumta Farm. N. Kanara.

San hemp (Crotolaria juncea) is grown extensively in the Deccan and elsewhere as a crop for green manuring, as it has been found to be the cheapest method of adding organic matter to the land. It has been found that a crop of san hemp from one acre weighs from 18000 lbs. to 28000 lbs. (Vide Bombay Bulletin No. 47). The cultivators who are now growing san hemp would certainly welcome a plant which is both leguminous and heavy yielding. On the Kumta Farm a large number of species of plants are being tried with a view to find out those which are quick growing, which can yield large quantities of green matter and which can stand lopping. There are tree—growing and bush—growing species. Crotolaria anagyroides is one which has been introduced from Ceylon where it was reported to be faring exceedingly well. The trials on this farm during 1926 and 1927 have given very encouraging results which excel those of san hemp. This plant has not been tried in the Bombay Presidency as far as I am aware of. The results of the trial are given in the article so that it may attract the attention of the cultivators and others who are interested in the matter of green manures and further that they may give trial to it under conditions prevailing in different places side by side with crotolaria Juncea.

Crotolaria anagyroides was tried both under irrigation during hot weather and also as a *kharif* crop. The crop grown under

irrigation has given exceedingly good results and these are dealt with in this. That sown at the commencement of rains has not been able to give satisfactory results. The plants do not seem to stand the heavy rains of Konkan in the initial stage of their growth, for, a crop which had grown upto 5 ft. in height before the rains commenced has stood a precipitation of 90 inches without showing the slightest change for worse. The indications of this year's trial are that if a crop is to be grown during the monsoon, the seeds should be sown about the end of July when the force of rains has calmed down. The plants from the sowings of July have reached 10″ to 15″ by the end of August.

Cultivation :—A full grown plant covers a space of 4 ft. square. The seeds were dibbled at 2′ x 1′ two seeds being dropped in each hole. The seeds germinated within 3 days. The growth of the seedlings during the first month was at the rate of 3″ per week and from the second month onwards, the progress was rapid being 12′ to 15″ per week. In three months the crop reached a height of 5′ to 6′ with 3 to 4 branches. If the plants are tipped when they are 12″ in height, they produce a larger number of branches. In 3 months i. e. 15th March to 15th June, the crop reached a height of 8 ft. The crop was cut leaving ⅓ rd portion standing and the green material obtained (calculated from one guntha) amounted to 40000 Lbs. per acre. By August 15th, the fresh growth reached 3′ in length and this cut back to ⅓ rd its length, gave 8000 lbs. of green matter per acre. The plants are still vigourous and growing. The plants that were left unpruned reached to a height of 12 ft. by August 15th i.e. in 5 months time. From the observations made on two croppings it has been found that two loppings can very easily be obtained.

Crotolaria juncea was grown side by side. Its growth during the first month was faster than crotolaria anagyroides. But during the next two months, it was left much behind. The height of the former was 2½′ to 3′ whilst that of the latter was 5 to 6 ft. San hemp produced flowers at the age of 3½ months.

Thus it can be seen that crotolaria anagyroides is a fast growing species giving more quantity of green matter acre per Acre (viz. 40000 lbs. from the 1st cutting and a substantial quantity at the subsequent lopping if there is time to allow it to grow) than Crotolaria juncea (giving 18000 to 28000 lbs.) It is hereby suggested that this new plant may be given a trial side by side with san hemp.

The green loppings have also high manurial value when applied to the land. They completely decomposed within 4 weeks. The results on rice as compared with F. Y. M. are as follow.

	Quantity applied.	Grain per acre.	Straw
F. Y. M.	4000 lbs.	2300 lbs.	3000 lbs.
Crotolaria anagyroides.		3600 lbs.	3800 lbs.

The seeds of Crotolaria anagyroides can be had from the Central Seed Depot, Perediniya, Ceylon.

'OUR AGRICULTURAL TOUR'

PART I.

BY

V. K. BEDERKAR, B. A. (Sr. B. Ag. Class).

On our agricultural tour we started from Poona on the night of 30th October 1927. The first halting place in the tour programme was Baramati. The tiny train of the Dhond Baramati Railway, which looked like a toy when compared with the G. I. P. trains, carried us to our place of destination early in the morning. After being refreshed with tea and tiffin we started to visit Mr. Shembeker's farm and the salt-land Reclamation farm both of which lie on the other side of the Kara river which passes by the town of Baramati.

Mr. Shembekar gave us an account of his private farming. On the salt land Reclamation farm was explained to us the method of improvement of salt-affected lands by underground tile drains laid across the slope.

At this time rain overtook us and soon it began to rain cats and dogs. We were afraid that if we waited under shelter for the rain to stop, the river may be inundated and become unfordable. so we started on our wayback right in the down pour of rain. The

force of the current of the river had increased and as we began to wade through the river the water coming to the very waists of some, we had to exert ourselves to our utmost in order to cross the river safely. After crossing the river we began our homeward march—tramp! tramp! tramp!—through the rain. Water was dripping from our clothes and we were wet to the very bones. Some of us who did not feel at home in wet shoes had taken them out and were carrying them in their hands. As we were thus passing through the town, the inhabitants of the place, who, in the morning had looked on us with inquisitive eyes wondering as to what on earth we with our khaki shorts, shirts and hats had come therefor, now seemed to laugh behind their sleeves at the sight we presented and seemed to enjoy the merciless joke cruel nature was cutting with us.

In the evening we paid a visit to the Nira Valley Purchase and sale union. The next day we visited Mr. Uplekar's fruit garden and on our way back visited the Baramati Sugar factory and the Baramati Government farm.

Our next halt was at Mahol. Mr. Kanitkar—formerly Asst. Professor of Chemistry at our College and now soil Physicist to the Government—delivered to us a very interesting lecture on the subject of Dry Farming and showed us some of the dry farming experimental plots at the Mahol Government Farm. From Mahol we began our journey in the Karnatic.

At Gadag we paid visits to the Taluka Development Association and the Cotton Sale Society and studied their constitution and the work they were carrying on.

At Hubli we went to see the Hubli Cotton Sale Society. Rao Saheb Shirhatti–the president of the society—explained to us its working. He then gave us a sumptuous treat for which we thanked him by giving him three cheers.

From Hubli to Dharwar we travelled by buses. At Dharwar we heard and saw how selection and hybridization is done in Cotton. Mr. G. S. Kulkarni explained to us the Research work going on at the farm in connection with cotton wilt. The Superintendent of the Dharwar farm took us round the farm and showed us the various manurial, cultural, and crop experiments that are under investigation.

At Dharwar we hired buses and went to Bankapur where there is a Government Cattle breeding farm for breeding pedigreed animals of the Amrutmahal breed. We saw the herd on the farm and also some animals typical after breed. Mr. Gadagkar-the superintendent of the farm--entertained us with meals befitting bona fide agriculturists, which consisted of jowar bread, cooked vegetable and Chatni, accompanied by curds and home made butter. It was 'hard lines' for a few of us who were quite unused to jowar bread and Chillies but the majority of us did more than full justice to the meals proving that we were not agriculturists in mere name, keen hunger coming to our aid in making the meals which were already tasteful, more delicious than even a palatial dinner. We thanked the superintendent and started for Sirsi in the same buses.

At Sirsi we visited the famous spice gardens. We were wonder struck when we saw the vastness--some of these gardens were 3 miles in length--and the perfect lay out of these gardens. These are situated in vallies between two spurs of hills. Along the broad ridges or 'Bharans' as they are called grew the betelnut palms with their tall, straight and slender stems and a crown of leaves at the top, shaking their majestic heads to and fro even at the feeblest gust of wind. In betwee i the leaves were to be seen bunches of betelnuts in the different stages of maturity--from the green ones to the over ripe yellow ones--covered over with Kottes. In between the betelnut palms were to be seen the Cardimum plants with the clump of leaves rising from the underground rhizomes and growing to a height of 6 ft, and with fruits borne on the flowering shoots which trailed along the ground in a zigzag manner. Lastly there were the pepper vines climbing the betelnut palms, supporting themselves by driving their tiny claw like tendrils into the bark of the palms.

Our next place of halt was the famous Gersappa fall. On the way-at Siddapur we were entertained by a host 'in cognito'. Near Siddapur in one of the betelnut gardens we witnessed a demonstration of Kotte-tying and spraying. The strong and muscular body of the climber presented a statuesque appearance with the perfect Greecian symmetry of form and his paraphernalia which was to be seen on one part or the other of his body, though crude to look at, gave every evidence of ingenuity of the brain that had invented it. On one side of his waist was a small sickle for cutting the betelnut bunches whenever required. On the other side of his waist was to be seen an iron hook with a long wooden handle. Whenever he

wanted to pass from one palm to the other he never used to come-down to the ground but climb the other palm by means of the long-handled hook he used to bring the palm near himself and coolly jump from one palm to the other. By means of the same hook he used to bring the trees surrounding the one he was on, near himself and used to spray the bunches on them. At his waist again there was a long rope one end of which was secured to the waist, by means of which the sprayer was sent up to him. Whenever he harvested any bunch of betelnut he used to leave the rope down with one of its end dangling on the ground and along it used to glide the bunch to the ground uninjured. At his waist too there was a wooden seat which he could secure against the palm and on which he could rest himself when tired. On his chest there was to be seen a breast plate made of betelnut leaf sheaths and in which he carried betel leaves for his own use. Lastly there was the long cap on his head which had a pocket at its hinder part in which tobacco was to be seen. The climber climbed the palms with the agility of a monkey and whenever he was tired we found him perched on the wooden seat, 30 ft. or more from the ground feeling quite at ease high up in the air.

The falls presented a beautiful sight specially in the moonlight at night. As we sat in the varandah of the British Bunglow looking at the falls, the continuous noise the falls made while falling—Dho! Dho! Dho!—was dinning into our ears and our eyes were drinking the beauty of the scene. In the moonlight the falls had the appearance of streams of molten silver continuously pouring down into a chasm of unknown depth. Waters of the Shiravati river were falling continuously down the steep precipice, in their serene majesty, unmindful as to whether anybody was watching them or not—perhaps in the hurry and bustle of the unexpected, steep and sudden fall they had no time to do so—reminding us of Tennyson's lines from his poem 'Brook'

" Men may come
and men may go
But I go on
for ever "

The water, as it fell down the steep precipice and by the time it reached the bottom of the chasm, was shattered as it were into innumerable tiny droplets which joined together in the valley and formed white, thin and translucent sheets of mist. These slowly

rose up like ghosts in their white shrouds starting from their graves and eclipsed the falls from our view for a time but were soon dispersed in several directions by a blast of wind.

From the Jog Falls we motored down to the village of Gersappa. Our way to it lay down the Western Ghats. On both sides of the road was to be seen a green thick forest. Here and there on the ground was to be found a thorny, carpet of Touch-me-nots which have found a congenial home in these parts and are spreading everywhere like wild fire and as a weed have become a nuisance difficult of eradication. In the forest were to be seen trees with immensely large girths growing quite erect in a straight line 100 ft. and more till they seemed to kiss the sky itself. In the forest too was to be found growing luxuriantly with their native vigour of growth many an ornamental plant which either refused to grow or used to grow reluctantly at Poona, because in these places it was nature herself—not the artifice of man—which had planted them and had bidden them to grow. The road so to say was lined with various ferns ornamental palms, orchids and epiphytes. Now and then a streamlet was seen meandering down the hill slopes either jumping and leaping down with mad fury into the chasm below or gliding down into silence in its sheer prestine purity.

From Gersappa we sailed down the Sharawati river to Honaver by 'Machwa'—an open boat with a hutlike structure in it. The journey was the most pleasant and picturesque one. It was a calm and clear moonlight night the full moon shining in all her glory in the blue sky which was studded with myriads of twinkling stars. A cool gentle breeze was fanning the water of the river which gently heaved up and down giving rise to innumerable small wavelets. Our boats were gliding down the silvery water with a motion scarcely to be felt, their sails fully spread out. On the two sides were to be seen the sandy banks along which grew the tall Coco-nut palms raising their heads one above the other and behind which were the wooded hills forming a green back ground of exquisite beauty.

We reached Honaver early in the morning. Mr. Tagarsee the forest officer at Honaver entertained us with a sumptuous breakfast.

Honaver to Kumpta we went by buses. At the Kumpta Government farm the superintendent took us over the whole farm and explained to us the various manurial, cultural and varietal experiments with regard to Rice and Sugarcane that are being carried out

there. We visited the Kumpta Areca Sale Society where we saw the actual sales going on. At Hegde we studied the cultivation of cocoanut and saw two cocoanut gardens-one planted and cultivated according to the local method and the other according to the improved method. The owner of these gardens entertained us. At Hegde we boarded a power launch and landed at Tadri harbour. From this place we paid a visit to Gokarn Mahableswar—a place of piligrimage of the Hindus-where Mr. Sannabadti a recent graduate from our College entertained us.

At night we boarded the steamship S. S. 'Wegawati' and landed at Marma Goa the next morning. After a doctor had felt our pulse and our luggage had been subjected to fumigation we went to Punjim by steam launch where we made a day's halt. In the evening we visited the famous Church of St. Francis Xavier—a huge and massive at the same time artistic structure with beautiful wood carvings and golden paintings of exquisite beauty-built by the Jesuit Portugese priests 350 or 400 years ago.

S. S. Champawati took us from Goa to Ratnagiri. On one side there was water and nothing but water and on the other an unromantic rocky shore. The monotony of the scene and the compulsory confinement within the narrow limits of the boat for 12 hours oppressed us. The peculiar nasty smell-a combination of the smell of fish and salt-greeted our nostrils on all sides. The majority of us were used to the 'terra firma' and that is why the unsteadiness of the ship created a reeling sensation in our heads. Some of us actually suffered from Sea-sickness. When our feet touched the firm earth at Ratnagiri we felt immensely relieved.

From Ratnagiri we visited the Nagli breeding station at Hatkhamba and the Shirgaon Government farm which is a rice breeding station for South Konkan. We studied the varkas land cultivation and the cultivation of high class mangoes on the hill slopes. Mr. Wagle told us something about the research work he was doing on Mango Flower blight. The superintendents of both the Hatkhamba breeding station and the Shirgaon farm entertained us with light tiffins.

S. S. Champavati brought us to Bombay and thus ended the first part of the tour.

Now that the tour is over we can say that it was a thorough success and we enjoyed it to the utmost. During this part of the tour

we had covered half of the Bombay Presidency. We visited and saw many places of note from agricultural point of view as well as a tourist's point of view. We travelled by all sorts of vehicles, by land as well as by sea-on foot, by bullock carts, buses and broad gauge as well as meter gauge trains, small canoes, boats, power and steam launches and steam ships. The arrangements during this part of the tour were excellent and after we left Mohol, wherever we went we were treated with unreserved hospitality, its beginning being made by Mr. Dharwarkar at Gadag. Our thanks are due to all these people. Our thanks are also due to the staff of the agricultural department at the various farms and places we visited, for the excellent arrangements as well as for giving us all the information available.

Our thanks are due to Prof. Gokhale at whose suggestion and effort this part of the tour was undertaken. Throughout the tour he used to mix with us freely, used to realise our difficulties, to sympathise with us and to share with us all the hardships of the tour. Though he had seen all these parts several times he showed us all the places worth seeing with renewed interest and enthusiasm and gave us all the information that was worth knowing.

Our thanks are due to other members of the staff accompanying us viz. Messrs Advani and Desai, who were directly in charge of us. They also used to mix with us freely and gave us a very friendly and sympathetic treatment throughout the tour.

The fitting end to the account of such a tour will be to give three cheers to the tour and to those who helped to make it a success, Hip! Hip! Hurra!

THE EFFECT OF CLIMATE ON THE GROWTH OF PLANTS USING ALL ECOLOGICAL OBSERVATIONS IN NATURE.

BY

I. A. SAYAD, Sr. B. Ag. CLASS.

(Prize Essay).

Plant has twofold aspects; the one considers the individual organism and component parts as related to environment; this since it overlaps Morphology and Physiology may be called Morphological and Physiological ecology or the ecology of plant structure and behaviour. The other aspect considers *en masse* as related to *soil and climate*; this since it overlaps Physiography may be called Physiographic ecology or the ecology of vegetation. Morphological and Physiological ecology considers the same materials as do morphology but largely from a different point of view. Morphology deals with structure and Physiology with the behaviour, whereas ecology relates both structure and behaviour. Morphology and Physiology are essentially laboratory sciences, while ecology is in the main a science of the field treating organisms as they grow in nature.

The word ecology comes from the Greek word " oikos " meaning house or dwelling. In its widest meaning, ecology is the study of plants as they grow in nature.

Let us considsr the climate. Climate is the most determining factor in the growth of plant and as such let us understand what it actually means and what are its general features.

Climate is the condition of place in respect to its temperature, moisture, dryness, rainfall, courses of wind and frequency of voilence of storm. Climate therefore is nothing but the condition of atmosphere. The climate factors include the general features of :—

1. Regional climate and season; 2. Light; 3. Temperature; 4. Moisture; 5. Humidity; 6. Direction and courses of wind 7. Atmospheric electricity.

Now I will try to find out what effect this individual factors, which come under the main category of climate, produce on the growth of plants ecologically.

Aggregate plants usually form vegetation which is mainly due to nature rather than man, and since plants are common in their occurrence, we cannot recognise their existence in nature unless we consider them as the members of plant community.

Light :—Light exercises a stimulating influence on the growth of plants which depend not on the intensity of light but on the direction of the rays. The influnce of light as often noticed brings about some structural modifications in the growth of plants. The general paratonic influence of light is to retard the growth of plant in the length of stem, roots, and leaves.

Sciophytes or shade loving plants have frequently large leaves, long internodes and long stems. Mosses and ferns are common examples of Sciophytes. When there is enough of light, plant makes healthy growth, but when a green plant is grown continuously in darkness, a pathological condition is brought about, as a result of which stem grows enormously long, while the size of the leaves is very much reduced.

We often find weeds growing in the sea and their existence under water can be accounted for by reason that certain amount of light rays are absorbed by these Hydrophytes in passing through water. But if they were to exist below a certain depth where the light rays cannot reach, further growth will cease in no time.

Plants with thick leaves, so called Cladodes, where a stem structure takes the function of a leaf, prefer bright sunlight otherwise their inner assimilating organs, will receive weak light and thus growth will be arrested. The common example is Opuntia which is a Cladode.

During the growth of plant, plant members take up a definite light position which remains fixed. It has been noticed that this fixed light position assumed by leaves is such that they turn their upper surface not towards the brightest light but towards the brightest diffused light. Sometimes the leaves assume a horizontal position when a growing plant is exposed to light. But when exposed to intense light, they revert from the original position and assume a vertical one, in which case the surfaces are directed east to west.

Sun-plants on the other hand, if exposed to very intense light have usually small leaves, and short internodes. (Sunflower and Cactus).

We therefore conclude from the above ecological observations that light is essential for the life and growth of a green plant. Plant life depends on light. Light accelerates the growth of plant.

Temperature :—Temperature is of great importance to the growth of plant, as it greatly helps in carrying out the vital processes that are going on in the plant body. Temperature also exerts a profound influence on the geographical distribution of the plants, for the mean annual temperature varys widely in different countries and localities. Plants that store large amounts of water in their tissues and that owing to very active life require a rapid and constant stream of water to their parts are particularly susceptible to the extremes of temperatures (excessive heat and cold), and the abrupt changes serve as a hindrance in the normal growth of plants.

Another striking effect of temperature on the growth of a plant is that under conditions of high temperature plant growth is decreased and its size is very much reduced. Every plant will develop best with a certain sequence of temperature. Many plants require less heat for developing their flowers than for vegetative growth. It is the law of nature commonly observed that variations of temperature are never agreeable to plant growth and more particularly so with all the higher plants which cannot grow when the temperature is 32 Deg. F. or 122 Deg. F. At this stage of extreme temperatures all the vital processes of plant growth almost cease.

Moisture :—This factor is of prime importance for plant growth indirectly but as a direct factor it is seldom of importance. The development of plant externally or internally mainly depends upon the quantity of water absorbed and the proper distribution of water. This factor under certain adverse environmental conditions is greatly economised. Plants which show special adaptation in economising water supply are known as Xerophytes.

Plants in tracts of localities which depend very little on natural precipitation, go through a period of drought every year, and hence develop certain characteristics or modifications by means of which they adapt themselves to this sort of environment. Xerophytes or drought resisting plants exist in dry, hot, and sandy regions where water supply is uncertain and rapid transpiration always in action.

Prickly Pear is a very good example of a Xerophyte and although it appears to be devoid of leaves, yet it produces tiny leaves

which drop down very soon. Nature has made provision for water supply for these Xerophytes by development of succulent stems and for the reduction of transpiration by the absence of leaves. Under adverse environmental conditions, Prickly Pear converts some of its buds and leaves into spines, reduces its number of foliage and thus economises the scanty supply of water. Spines produced on succulent stem serve to protect itself from other disturbing influences. Cactuses, Acacia and Euphorbias are good examples of draughts resisting plants.

Another ecological phenomenon was observed, with regard to Draught resisting plants in the *Deccan*, when during the year 1918–1919, there occurred one of most severe and long continued draughts. The rainfall was ½ or ⅓ of the normal average. The results were very striking. The whole country appeared browny and many plants died before producing seeds. In certain places, even such resistant plants as Acacia arabica died. Ficus bengalensis shed its leaves and even Opuntia nigricans turned yellow and ultimately drooped down.

Therefore a plentiful water supply as a rule favours the growth of plants which the scarcity of water brings about reduction in the vegetative parts of the plants.

Wind :—Wind is also important but not so much as previous factors. We find bushes growing along sea cliffs where their branches bend over in the direction of the prevailing wind, is due to death by excessive transpiration of these parts of plants directly facing the wind. The general effect of wind is to increase the transpiration by bringing unsaturated air in contact with leaves, as a result of which a dessicating effect is produced on shrubs and trees. From the above fact, we can easily account for the dwarf and stunted forms assumed by plants growing in the regions of high altitudes, where high winds are constantly prevailing. It is obvious therefore, that the condition in these regions is absolutely unfavourable for the growth of plants. Naturally drier the air, the greater the velocity of wind, the more conspicuous the effect. Under extreme condtions we have the blighting effect on young shoots resulting in death within a few hours, owing to loss of water by excessive transpiration.

There may be some exceptions and naturally some may survive. Trees which are exposed to less extreme conditions may be of some importance in determining the distribution of plants. Certain

are well known to foresters to be " wind resistant," either because they are well protected against ex essive transpiration or because their twigs and branches are sufficiently strong to resist the high winds.

The following are the disadvantages of wind :—

1. Roots are restless and have no function.

2. Stem is broken.

3. Leaves are also broken.

4. Pollen is taken away by the wind and thus fertilisation is prevented.

5. Young fruits fall down.

6. Hot winds burn the plants.

7. It brings fungus spores and causes desoase to plants.

8. Where high winds blow there is no vegetation.

9. It kills the growing apex of the plant.

10. It removes cell-sap from roots, leaves, fruits etc, by its hot current by evaporation.

The above mentioned poin's clearly show the destructive effect of wind on the growth of plants.

Atmospheric electricity :—As regards atmospheric etectricity in earlier years, long before the subject of science had made any headway in its researches and profound studies, obsevations on atmospheric phenomenon and its relation to plant growth occupied a very important position in scientific investigation. I give one example, which, could be taken from eighteenth century writers, I quote from Rev. Gambattista Beccaria : "With regard to atmospheric electricity, it appears manifest that nature makes an intensive use of it in promoting vegetation."

There are many views presented by different 18th. century writers in favour of this factor and one of them may be put in few words.

When plants begin to grow, temporary electric clouds begin to appear and pour down electric rain. Hence the electricity which is obtained in clouds and rains, when carried to a certain degree, serves to promote with regard to the growth of plants the effect of common heat. Besides mild electricty in excess certainly contributes and promotes the growth of plants.

Many writings are still to be found in the literature of the earlier half of 19th. century, which are no less ecological in their outlook than that of Beccaria. I quote an example from the papers of William Sturgeon:

" Clouds are highly charged being endowed with a formidable repulsive force, act at a great distance and at all times of the year. In the spring and summer months they are often productive of lightening and teem out heavy rains which bring down immense quantities of electric fluid to the ground and occasion these smiling looks and healthy changes in the growth of plants which no ordinary showers ever produce. "

Changing seasons :—Sometimes the effect of changing seasons is so cospicuous, that during a certain year when the season changes all of a sudden, a very unfavourable condition is brought about in the normal growth of plant. Plants also persist in a more or less dormant condition when a particular change of season is unfavourable to their growth.

In cold countries, many plants have adopted themselves to variations in season and as such, are found to be growing in winter. But in the case of ever green trees, they have their leaves on for a couple of years and as soon as winter sets in, leaves usually die and ultimately drop down.

In India, we seldon have severe winter, as the temperature does not go below 40 Deg. F. and hence we do not experience any marked effects in the normal growth of plants. But plants are able to withstand a certain amount of cold, for nature has provided them with a layer which serves two purposes. The more important one is that it acts as a protecting agent against the loss of water by evaporation and to a lesser extent acts as a jacket which maintains heat inside the plant tissues.

A very interesting phenomenon was observed in Poona with regard to change in season. In the year 1924, there occurred a severe frost the like of which had once occurred sometime in 1910. The observations were interesting and equally shocking. It was interesting from ecological view point and disastrous from the effects produced. The temperature had gone down as below as 33.5 Deg. F. Many plants suffered from the unexpected shock as a result of which many plants died while some did survive after a very hard struggle for existence. The effect was very marked on cotton plants

especially as the long expanse of cotton field (Agricultural College Farm) assumed dark colour, particularly the leaves, mourning as it were and none survived from the disastrous effect of frost. Cabbage, although by nature a winter crop does require a cold temperature during certain stages of its growth, did suffer to a certain extent but resumed its normal growth in a couple of days when the temperature had gone above 40 Deg. F.

The whole of Chillie plantation appeared yellow and majority of plants died before developing into fruits.

The following are the ways in brief in which climate modifies plants, as regards their growth and which is nothing but summation of some of the factors already discusssd above.

1. Climate greatly modifies the stature of plants. They become dwarfer in high latitudes and altitudes.

2. It modifies form. Plants tend to be broader and prostrate in high latitudes and altitudes.

3. Plants modify their form, size and change direction according to intensity of light.

4. Proportionate leafiness generally increases according to the nature of climate (temperature).

5. There is variation in the variability itself. The more difficult the climate to which a plant finds itself the more it tends to vary to meet the incongenial environments.

6. There may be a profound variation or modification in constitution and habit by which plants become aclimatised or enabled to endure a climate injurious to them. It generally comes about however, through a change in habit, by which plants, when transferred towards poles, shorten their season of growth or become annuals.

COLD STORAGE IN BOMBAY.

BY

SOHRAB. R. GANDHI., M. Ag.,

The consumption of fruit and other perishable food stuffs such as meat, fish, eggs, butter etc., can best be stimulated if they are displayed in the market in their entire freshness. There is no other method than *refrigeration* by which these food stuffs can be preserved in their original state. The refrigeration is nothing but a thermal control produced in an insulated * house which is called a cold-store.

The immediate benefits of cold-storage of food stuffs are many. The surplus of extremely perishable food stuffs is preserved from the season of plenty to that of scarcity, stimulating production and providing for the producer a year-round market. A large part of the best fruit and other perishable food stuffs could be promptly withdrawn from the market at the harvest time and preserved in the cold-storage. In this way, prices are less likely to be depressed. Besides, the most distant countries producing perishable food stuffs are brought nearer to the consumer, especially, when the refrigerating plants installed near big markets are helped by the railway refrigerator car.

The chief aim of this paper is to briefly describe the refrigerating plant installed at the Crawford Market, Bombay. This refrigerating plant comprises four store chambers in which the cooling is effected by what is known as ammonia compression system. The machinery of the refrigerating plant installed at the Arthur Crawford Market, Bombay, is mostly supplied by Messrs Lightfoot Refrigerating Co., Ltd., London and the actual plant was erected by Greaves Cotton & Co., Ltd., Bombay. As mentioned above, the plant is run on the ammonia compression system. The compressor is belt-

* Detached from outside by a linining of a material which is a very bad conductor of heat.

driven by a 64 h. p. motor working from a 450 volt direct-current supply at 450 revs. per minute.

The cooling is effected by the evaporation of anhydrous ammonia which is a very volatile liquid. The gaseous ammonia to begin with, is compressed to reduce it to a liquid form. During this process a quantity of heat is developed which is carried away by forcing the compressed gas through a coil of pipes which is constantly kept cool by an incessant flow of dripping water. At this stage the gas becomes liquefied and is immediately admitted to a coil of pipes immersed in an insulated tank of noncongeable solution of calcium chloride which is kept agitated by means of a belt-driven agitator. When the liquefied gas is allowed to enter into this coil of pipes, it suddenly expands flashing into a gaseous form in doing which it withdraws heat from the surrounding brine. Thus, after cooling the brine to about 15°F, the ammonia passes to the compressor in a gaseous form to be compressed and used over and over again in the system.

The cooled brine from the insulated tank is finally pumped through a system of pipes in the insulated chambers which are to be refrigerated. Each refrigerating chamber has its own delivery and return pipes. These return pipes discharge themselves back into the refrigerator tank where the brine gets recooled to be recirculated through the system.

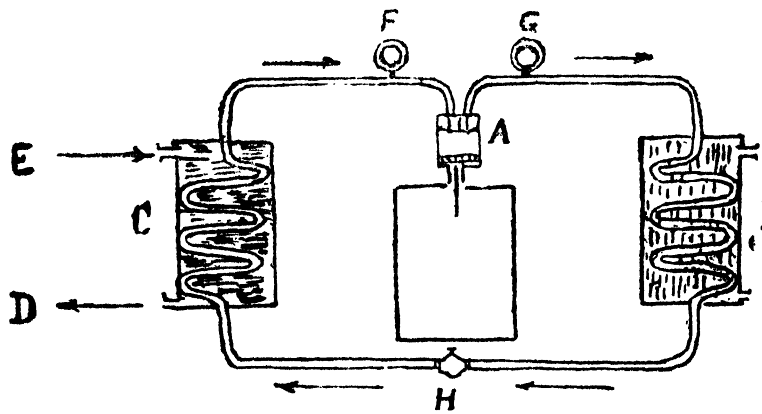


Diagram illustrating the cycle of operation in the above mentioned Refrigerating machine.

A. is the compresso in which the anhydrous ammonia is compressed.

B. The gas in these water-cooled coils is liquefied. Water is kept dripping over these coil .

C. Liquefied ammonia in these coils takes up the heat from the surrounding brine kept in this insulated tank and re-expands into gaseous form and finally passes again to the compressor.

D. The cooled brine is carried to the cold storage chambers, through a system of pipes.

E. Return pipes discharge into the refrigerator tank where the brine gets recooled, to be recirculated,

F. & G. Pressure guages.

H. regulating valve.

The most important feature of the refrigerating plant is its insulation. The means adopted for insulating the refrigerating chambers consist in lining them with some material which is a very bad conductor of heat. The walls of the refrigerating chambers consist of an outer and an inner layer of tongue and grooved boards with a one foot space between them which is filled up with paddy husk and teak saw dust which are very cheap non-conductive materials.

The refrigerating chambers are arranged to open into a well insulated corridor by which the heat from the outside is prevented from entering directly to the cold storage chambers, when the doors are opened to place the food stuffs or to remove them from the cold storage. Care is also taken to make the outside brick-wall of the whole cold-storage building, water-proof and airproof as far as possible.

The total space occupied by the cold storage chambers is 10,000 cubic feet, comprising four rooms. Though the main cooling system is one, the cooling effected in these four separate rooms is brought about in defferent manners. The two top rooms are cooled by a number of brine pipes on the ceiling and walls. The air in contact with the cooling pipes as it is cooled and wetted flows downwards towards the floor and the comparatively warmer air above is brought again over the pipes where it is in turn cooled and so the process continues. The approximate temperature maintained in these rooms is 20°F and the articles stored therein are fish and meat which require to be frozen to preserve for a very long time. Each of these rooms is capable of holding about 22 tons of fish. The meat in these chambers is said to preserve in good condition for more than a year without loss in food value or general wholesomeness.

The left-hand lower room is a dry cooler chamber. In this chamber the brine pipes are fixed on the side of the walls. These

brine carrying pipes are turned into a series of coils which are placed in a special air tunnel built into one side of the chamber. In front of the coils there is an electric-fan which dashes the air of the room against the frosted coils. Consequently the air becomes cool and is driven through the openings of the special air-duct on one side of the room and after circulating into the room, the warmer air is sucked through the openings of a similar air-duct on the opposite side of the room. The openings provided in the air-ducts are square openings filled with sliding shutters to regulate the flow of air into the room. This room is meant for storing fruits and can hold about 33 tons of fruits. The temperature maintained is 35° to 40°F which is suitable to store fruits of temperate climate-such as apples, peaches, apricots, pears etc.,

The right-hand lower room is cooled mostly in the same way as the left hand chamber but the brine coils in this case are run over by brine water cooled to 16°F which is pumped from a tank underneath and made to drip over the coils. The air agitated by the fan dashes against the coils, gets cooled and is driven through the air-ducts into the chamber. In this chamber mostly tinned foreign fish is stored and is suitable for freezing fresh meat also. The temperature maintained is 15 to 18°F.

REFRIGERATION AS A MEANS OF PRESERVING MANGOES AND OTHER TROPICAL FRUITS.

(Reprinted from the Agricultural Journal of India Vol. XXI Part V. Sepr. 1925.)

The use of cold storage as a means of preserving fruit and vegetables is known in most parts of the world, but it has, except in the case of bananas, not been applied extensively for the preservation of the usual tropical fruits, and particularly of the mango. And yet there are few cases in which, if applicable at all, it would be of great value. Many of the tropical fruits, and again particul-

arly the mango become ripe in a very restricted period, and a period when there is a glut in the market and a correspondingly low price, is rapidly followed each year by a time when there are no fruits to get and the price is very high.

Though much information is available as to the conditions under which semitropical fruits can best be kept in cold storage, yet few data are available in connection with the fruits dealt with in the present paper. As regards the mango, one authority[1] states that he was able to preserve the fruit for 31 days at 34° to 40°F., and another[2] reports that experiments in shipping mangoes from Australia at a temperature of 35° F. were satisfactory.

The experiments recorded in the present paper were made at the cold store in the Crawford Market, Bombay. The range of fluctuation of temperature in this cold store is much greater than is desirable, but is unavoidable when it has to be frequently opened to bring in and take out materials kept on a commercial scale. The records have been made during the three seasons of 1923, 1924 and 1925.

Mango. Two varieties of mangoes were used in the experiments namely, *Alphonso* and *Pairi*, two of the best types in India. The former keeps much better than the latter, but, for both, a steady temperature of 39° F. to 40° F. was found suitable. At this temperature, mature and green Alphonso mangoes can be kept for a month without deterioration. Tightly packed fruit wrapped in tissue paper kept longer and better than loosely packed and unwrapped fruit. This suggests that even a somewhat higher temperature than that named would suit the fruit quite well. As a matter of fact a rise in temperature to any point between 40° and 50°F. did no harm to the stored fruit.

A sudden fall in the temperature below 36°F. told at once seriously on the fruit. The skin became immediately spotted, in the form of small scattered depressions all over the skin of the fruit. When the temperature was reduced to 25° F. the skin of the fruit was softened, but the damage did not go further when the temperature was raised above 40°F. and ranged between 45° F. and 50° F.

1 Higgins. The Mango in Hawaii. *Hawaii Agri. Expt. St. Bull.* 12, 1906.

2 Collins. The Mango in Porto Rico. *U. S. Dept. Agri., Bureau of Plant Industry, Bull.* 28.

A sudden fall in the temperature did not affect the pulp of the fruit nearly so much as the appearance of the skin. Spotted fruits, in fact, when taken out of store after 20 days, ripened well from within, and the taste was almost as good as that of fresh fruits. The low temperature affects ripe or half-ripened fruits more seriously than green mangoes.

Green Alphonso mangoes which had been in the cold store between 36° to 40° F. for a month took six days to ripen after withdrawal, and kept good for ten days further. These were exceedingly attractive in colour, as good, in fact, as naturally ripened mangoes.

Chiku (*Achras sapota*) *or Sapodilla plum.* This fruit, which is a great favourite in Bombay, when green, resists temperatures below 40° F. better than any of the others tested. The skin does not become pitted like that of the mango by a low temperature. Frequent fluctuations, however, below 40° F. make the fruit very hard and it ripens very unevenly when removed from cold storage. Between 40° and 50° F., green *chikus* could be kept for a month, and then ripen normally when removed from the cold store.

Banana. Green bananas of the principal varieties cultivated round Bombay—*Rajapuri Sonkel*, and *Red Bassein*—could be kept without change of colour at a steady and uniform temperature of 40° F. and could be normally ripened after removal from cold storage.

Fluctuations in the temperature below 40° F. affected the green fruits and gave them a smoky colour. The yellow and ripened fruits became softer and darker. When the temperature fluctuated between 40° and 50° F, the bananas, either green or ripe, were not affected.

Ripe but firm fruits were also successfully kept at a steady temperature of 45° F., but the skin became darker in colour. Ripe bananas when wrapped in paper showed their original freshness on removal from the cold store, but unwrapped fruits lost their lustre and became dull.

Green bananas kept in the thawing room, with a temperature ranging between 55° F. to 60° F., changed colour from green to greenish yellow within seven days. These greenish yellow bananas kept quite well in the cold store at 40° F. to 43° F. for 15 days with repeated (three times) fall of temperature to 30° F. and equally

gradual rise again to 42° F. The colour of the skin was, however, darkened by this treatment.

Papaya. The papaya fruit does not seem to keep well under the conditions of temperature available in the cold store. It remained good for a fortnight at temperatures above 40°F., but on removal from the store, it did not ripen evenly, and the ripened fruit presented firm flesh in places while in other parts the papaya was soft. The colour of the flesh was quite similar to that ripened in the ordinary way outside the store. [G. S. CHEEMA and S. R. GANDHI.]

DR. HAROLD HART MANN.

A man of high intelligence, of outstanding abilities and capacity, and in addition of public spirit and activities is remembered for a long time by his actions and especially by the void created by him when he goes out of the field. Such a type of man was Dr. Harold H. Mann Director of Agriculture, Bombay Presidency who retired on the 16th October 1927 and whose career we briefly describe in the following few lines.

Dr. Mann was born in York on 16th October 1872. He received his elementary education in his native city. For higher training he joind the Yorkshine college (Leeds) and obtained his B. Sc. degree in 1892 from the Victoria University with first class honours in Chemistry and the Leblanc Medal of the University for Technological Chemistry. He soon became an associate of the institute of chemistry and shortly afterwards a fellow of the Institute.

His distinguished career at the University obtained for him an "1851, Exhibition Scholarship" for Research of £ 150 per annum for two years. In 1893-94 he went to the Pasteur Institute where he worked specially under the Late Prof. E. Duclaux but knew and felt the inspiration of the great scientist—Pasteur himself, whose memory he cherishes with the fondest devoutness. His investigations there were on the action of certain antiseptics in yeast the results of which were published in the "Annales de Institute" Pasteur in 1894. On his return to England he spent sometime on

Research in organic chemistry and then joined the Royal Agricultural society as a Chemical Assistant for Research under Dr. J. A. Voelakar. Shortly after he was placed in resident charge of the Experimental and Research Laboratory at Woburn in 1898

He got his M. Sc. degree in 1898. After serving at the Royal Agricultural Society for two years more he came to India in 1900 as a Scientific Officer to the Indian Tea Association and organised the scientific Department of that association. When he took charge, the budget of the scientific department was 27000 per annum; but he worked hard despite the ill-equipped Laboatory and insufficient apparatus at his disposal and expanded the work in such a way that in 1904 the budget was raised to between 40000 to 50000 and a second chemist was appointed. It was he who established an Experimental station for the study of Tea in Assam and developed it. Shortly after an Entomologist was appointed and gradually the scientific department of the Indian Tea Association, has expanded to its present extent.

He served as the scientific officer for seven years and during that period published good many publications. He did not confine his attention only to the chemistry of Tea, but along with it studied also the diseases of Tea caused by different kinds of pests—Insects, Fungi &c., and the results have been published in 1903 in a book known as *The Pests and Blights of the Tea-Plant* in collaboration with Sir George Watt. His work on enzymes of the Tea-leaf and the fermentation of Tea during the manufacture and in addition his various other publications on Tea were sent as a Thesis to the University of Leeds which awarded him the Doctor's Degree in 1905.

By this time, on account of his brilliant achievements Dr. Mann had become sufficienty known in India and the Bombay Government offered him in 1907 the post of the Principal of the Agricultural College which was then newly started as a separate college. No better selection could have been made than Dr. Mann who had combined in himself all the necessary qualifications. In addition he was also appointed as the Agricultural Chemist to the Government of Bombay. In this capacity he served for about 14 years. During this period he worked hard and developed the new institution with care, tact and ability that it soon attained a name and fame far and wide and has been considered as one of the best colleges in India. Besides high efficiency in teaching, he created an atmosphere of Research which is so necessary for development of science. Being a man of versatile abilities and great erudition, he under-

took the study of many problems concerning Agriculture and published a lot of literature as a result of his reearch.

Besides his regular routine he spent his spare time in taking part in many activities-social and public. His work in village surveys is too well known to be forgotten. For many years he was a member of the Poona City Municipality. He was also for many years a member of the University of Bombay where he played a prominent part in the Senate and the Syndicate.

For all his manifold social activities, public spiritedness and his zeal for public weal and especially that of the poor agriculturists the Government of Bombay awarded him in 1917 First Class Kaiser-i-hind Gold medal.

In 1921, on the retirement of Mr. Keatinge, Dr. Mann was appointed as the Director of agriculture. This appointment placed him in charge of the whole department and thus afforded him ample opportunities for the display of his abilities and a very wider field for his activities. He had already grasped the whole situation and expanded the work of the Department in all its different branches-to mention notably-the work in Plant Breeding which has yielded very useful results. In Sind he started a Research Station at Sakrand in order to study the Agricultural Problems in connection with the Sakkar Barrage scheme.

He was a great writer and indeed an adept in putting together the scientific material in the most presentable form. He published considerable literature which would be an everlasting monument to his memory.

He was a man of great energy, and ambition and even to the last day of his retirement his zeal and enthusiasm for work was in the least unabated. In his speech at the time of one of the Farewell parties, he expressed that he was still capable of putting in active work for ten years more. Such is in short the life-sketch of Dr. Mann. Though he has left India, he has left behind him a legacy which can be well expressed in one word "spirit of service" which will surely keep his memory fresh for many years to come. Being a man of energy and ability we are sure he will not be passing quite a retired life, but we only hope him long life, health and happiness in whatever work he may undertake as a 'pastime' in his well-earned rest. (V. G. D.)

AN ACCOUNT OF THE ORGANISATION OF CO-OPERATIVE CATTLE GRAZING BY THE VILLAGERS THEMESELVES PRACTISED AT PIMPALGAUM-BASAWANT, DISTRICT NASIK.

BY

G. B. PATWARDHAN, ESQ., B. SC.

(*Ag. Economic Botanist to Government of Bombay.*)

The material and facts mentioned here-in below have been the result of the local and personal inquiries made by the writer during his visits to the place on 16th and 17th August 1927.

(*1*) *The Village*—Pimpalgaum-Basawant, a village with a population of 4500 is included in the Niphad Taluka of the Nasik District. The village is situated on the Bombay Agra Road, 19 miles from Nasik, from which place it can be reached in one hour by a regular motor service. It is a purely agricultural village. The people's wants are few and most of tham are satisfied by local productions. The soil is deep and fertile; the rain-fall is 12½ inches. The latitude and longitude are 20°D.-10'M. and 74°D-4'M respectively. Of the total population, 623 i. e. nearly 14 p. c. are agriculturists and the rest made up by weavers, labourers, traders, Mahars, Kolis &c. The total number of Cattle is 1236 of which about 441 are draft bullocks; the holdings in the village are 482.

(*2*) *Grazing area.*—This area which consists of 800 acres in one block is situated about 2½ miles to the North of the village and is not fenced. It consists of more or less flat land mostly of light soil and in parts black. It slopes a bit towards one side. There is a small nala inside the area and by raising a dam across it at a suitable place, the flow of rain water could be stored in a pond to provide a supply of water for cattle to drink in the dry season of the year. The whole area is formed by pooling about 22 survey numbers, assessed by Government to about Rs. 450. There are about 10 villages within a mile of the boundary of this Kuran, while the latter is three miles from Pimpalgaum-Basawant.

(*3*) *History of the land*:—Many years back—may be about 50 years back—this area belonged to a helpless woman, who was in debt. Under a civil court's order, the land was put for auction. The village people in a body contributed and paid off the creditor

and stayed the proposed auction sale and took possession of the management of the land, which they converted into a village *common grass land.* The exact dates of the above-mentioned transactions are not known and can be authenticated by no-body. It is said that there is a heir-a helpless woman still-of the original owner and that her name may be in the records. An enquiry with a view to authenticate the above history did not concern the present writer.

(4) *Management of land.*—The cultivators of the village are jointly concerned in the organisation of all details of the affairs connected with the area.

(5) Who is a *cultivator* of the village? (1) Every man or woman who owns land and lives in the village (2) A tenant living in the village and cultivating any land of the village, is a cultivator of the village. It is such a one who is a member of this *Kuran organisation* or *association.* Exception.—A Koli or a Mang though living and owning land in the village is not a member of this organisation.

(6) *The Procedure.*—All these people annually choose one leader who is styled Kuran Patil and a few panchas. The former has often been the Mulki-Patil of the village. But other men had been previously elected and had performed the duties of a Kuran Patil. The panchas are less than ten selected with care and full consent of all the cultivators. Probably some self-styled panchas sometimes introduce into the business. The Kuran Patil's duties are (1) to call meetings of the panchas or of all cultivators, whenever required, (2) to call for and collect subscriptions for payment of watchmen and of the cost of cutting of grass and distributing it, (3) to appoint watchmen, (4) to regulate their duties, (5) to impound foreign cattle and (6) call for help of members of the association of the cultivating public, whenever there is forcible trespass of men and cattle in more numbers than can be controlled and warded off by the two watchmen employed &c. (7) to fix the dates of admitting cattle to the Kuran, the dates of cutting grass (8) the apportionment of grass bales (loads) to different members, (9) to form subgroups of members for cutting grass and (10) allot survey numbers to such sub-groups &c One of the punchas helps in writing out accounts and issuing permits for the number of cattle to be allowed inside the Kuran.

Meetings of all members are called by the village crier at 9 P. M. in the village temple for discussing and settling several matters of detail that require attention in the course of the year.

One was called on the day of the writer's arrival in the village. The purpose of the meeting was to settle the number of cattle of each land-owner to be admitted in the area recently left open for grazing. It was notified that those who do not attend the meeting may stand the chance of forfeiting their right of admission to their cattle in the Kuran. We asked whether we could attend the meeting, but were informed that the meeting was meant for the local people concerned. We found also that the meetings were not attended by some cultivators.

(7) *Method of watching*—Just at the outset of the Monsoon, the Kuran Patil appoints two watchmen who are drawn from amongst the Kolis of the village and paid at the rate of about Rs. 10 or 12 P. M. who are required (1) to patrol the area day and night (2) to prevent trespass of any foreign cattle (3) to prevent entry of the village cattle until their admission is allowed and announced in the village by the local public crier under orders of the Kuran Patil (4) to catch and impound unauthorized grazing at any time (5) to admit cattle at the first time at least on presentation of a pass given by the authorised Panch (6) to give intimation to the Kuran Patil if the number of trespassing cattle are too many or too uncontrollable for them to catch and take to the pound or if the foreign villagers forcibly put their cattle into the Kuran at night or day time so that there is the necessity of personal fights.

Emergency Watching—If necessary upto 4 watchmen may be employed. Under the circumstances mentioned in (6) above, the Kuran Patil calls for the help of the cultivators from time to time and by turns in groups of 10 or 12 men or more if needed, who have to go in a body or to break away into smaller parties and go in different directions and round up cattle at night especially. Sometimes it becomes necessary for these parties to fight with the aggressive people of neighbouring villages and get bruises or wounds also. If the watchmen report that cattle of a particular village are tresspassing aggressively, then a special party is assigned the work of going towards the boundary of the Kuran nearest to the particular offending village. Such a party lies in wait at night for the cattle and catches them. If necessary some one of the enthusiastic members of this association, is allowed to patrol the environments of the Kuran on horseback. His horse gets free grazing in an apportioned area. I saw one horse tied and confined to the area to wander freely grazing even when there was so much grass growing in August at the time of my visit. If the watchmen

themselves happen to let in cattle surreptitiously, their act is detected by the villagers' vigilance. It is not possible for them (the former) to do so when grazing is permitted, because at this time the cultivators' bullocks are accompanied by one or two attendants who have an easy look on them. These attendant graziers stay there at night with their bullocks and drive them back next day for work. It is less difficult to watch the Kuran when general cutting of grass is in progress, because at that time, the respective block sharer takes away his share and does not interfere or allowed to interfere with the rights of other blocks. If any cattle is found to graze in the area reserved for cutting, the owner is fined one rupee per head of cattle. One of the watchmen may be absent for some 5 or 6 hours in the day when he goes into the village to fetch his bread or that of his companion.

(8) *Cattle allowed*—to graze are the working bullocks of the village fields owned by the cultivators defined above. Both owners' and tenants' bullocks are allowed. A few old or unserviceable or short time serviceable bullocks may be mixed up among them. Completely infirm bullocks do not go there. Cows, buffaloes, heifers &c., are not allowed to graze. The owners of these find grazing for them elsewhere on the mal lands of the village or along the boundaries of fields, nalas &c. The grazing in the Kuran is done at night or after the day's work is over. Bullocks not having work in day time are allowed entry in day time.

(9) *Opening and closing of pasture* :—In other places the practice is that cattle are allowed to graze immediately after a single shower. At such a time or even some time later there are fresh short blades of tender grass, which if grazed so prematurely, is checked in its growth. In this Kuran the date of the first admission of cattle is settled by the Kuran Patil in consultation with the punchas. They usually wait till the grass has advanced to what I might call half adult stage. In this year (1927) the cattle were let in only two days before our visit to the place (15th of August 1927). In the meanwhile the area is very vigilantly watched by the watchman concerned. The area first opened is such that bears small grass and rather thinly growing. Such grass is found usually on the outskirts of the Kuran and on shallow or mal land-parts of the whole area. Survey numbers having such grass are selected and declared open. This declaration is made by beat of drum in the village. The middle or inner survey numbers are not usually let in for grazing as they bear good grass which is apt to be trodden

by the cattle. The area opened just about the middle of August is held open upto the end of October or later if the amount of feed permits. The Kuran Patil with the advice of the cultivators, who inspect the grass growth at intervals, decide as to the date and time of stopping grazing or extending the grazing period. If necessary one or two survey numbers are added to the open grazing area. This is also settled by the Kuran Patil as before. After the grass in the areas reserved for cuttiug is harvested, cattle are allowed to graze all over and are carried till end of March.

(*10*) *Cutting of Grass*:—Survey numbers not open for grazing-usually the central or internal ones-are cut. A few years back all the area was cut by one central agency under the supervision of the Kuran Patil and the grass was distributed. But recently the method is changed. The separate survey numbers constituting the area, are pooled into a number of convenient blocks and each block is allotted among a group of cultivators say 6 or more of them. For instance A. B. C. D. E., are grouped and allotted a block of survey numbers X. Y. Z.; G. H. K. are allotted survey numbers. T. V. W. &c so on. The members of each group arrange to get the grass cut by employing coolies and distribute the grass amongst themselves. Suppose, if A. does not want to go into the group of B. C. D. E. for some reason or other, he is put into some other group and another man goes with B C D E instead of A. The whole of this arrangement is made by common consent.

The cutting of grass in the whole area commences by about the first week of October i. e. in Aswin month and continues for about 5 to 6 weeks. Cattle are let in to graze afterwards. From about 300 to 400 coolies are engaged on the job of grass cutting and they are paid at the rate of Rs. 2½ or 3 per *hale*. More wages are given for cutting the blue grass (Andropogon annulatus) मारवेल (marvel) and Rotboellia grass. (Vernacular name सुतळी (sutladi)).

(*11*) *Distribution of grass and costs*:—During cutting, the grass is tied into bundles (small bunches). These ars made up into *hales* each one of which is made of 1200 bundles. If the latter are small 2100 bundles go to make a *hale*. The number that will constitute a *hale* is determined by the Kuran Patil who takes into consideration average size of bundles prepared during cutting by the mowers. By weight a *hale* is a good full cart load. The cut grass is made up into hales and distributed to the members. Number of hales or quantity of grass one gets, is in proportion to the assessment of land, cultivated by him in the village. One

who holds large lands and cultivates it, gets a large share than one owning less land. A tenant living in the village gets free grazing for his working bullcks,but does not get any *hales*, but the land onwer gets the *hales*. The wages of the watchmen employed, of cutting, bundling, loading and delivery of grass, are charged to each land owner in proportion to the assessment he pays to Government on account of lands held by him. The recovery is effected more or less easily. If anybody fails to pay his share of the cost, he does not get his share of the *hales* and stands the chance of loosing his share of grass produce in the subsequent or future years. If in any year, the Kuran Patil or the punchas think that there may be difficulties in recovering costs, then the method of charging an entrance fee of Rupee one per bullock is adopted and the money is recovered in advance by means of issue of permits signed by the punch authorized in that behalf and issued on payment of the money. The watchmen in charge are instructed to admit cattle on presentation of the permit for the first time.

Grazing fines, proceeds of permits are duly charged to the cost of watchmen &c.

One or two village temples and charitable institutions, and a few others get a free share of the *hales*.

(12) *Discipline:*—Discipline among the partners in connection with the grazing &c., is usually very well maintained. Since many of the affairs are settled either by the punchas or by the elected Kuran Patil, there is little to complain of and few do it. All the same, complaints are not wanting: some say that a proper share of the grass produce is not delivered to them. Such people are usually those who do not take very active part in the co-operative management of the concern and in consequence lose by default. It is also a fact that a certain set of people of the village have a far greater influence in the management than others. But this sort of thing is bound to happen in any organisation and none stands to be blamed.

One of the persons actively concerned in the management of the Kuran told the writer that educated people are not fit for the proper discharge of the duties of the membership; they do not take active interest, but on the other hand raise a lot of complaints or issues which may cause trouble and besides they do not realise their responsibility of personal service required by the Kuran

Patil, but are ever ready to claim their share of grass or feed to their cattle.

Members not paying the cost of cutting or watching or other incidental expenses, or raising unreasonable complaints, are boycotted by debarring them from membership next year in other ways. On account of the fear of losing one's right, few people actually make complaints.

If any-body files a suit in the law-court which is situated in the village, he gets no evidence, oral or written, and no-body helps him. If one is forced by the court, to attend and give evidence, he pleads ignorance.

GENERAL REMARKS.

The organisation described above is unique, the like of which was not met with by the writer in the course of his experience with agriculturists for the last 27 years. It is as perfect as one could be -the best example of *Village Self-Government.*—It is apparently a singular and successful remnant of the Punchayat System of the olden days. The working is very successful and the aim of it, is bettering the grazing facilities of the cultivating bullocks and their health. The local cattle do not go elsewhere for grazing nor does the village feel shortage of draught animals for purposes of agriculture. This organisation is not hampered by codified rules, notices of meetings and their proceedings &c., things brought into existence by co-operative acts. Here finest co-peration goes on without the laws, rules meetings, &c. under section so and so &c. The cause of this success is to be found in the fact that there was common and a very pinching need to supply which there arose a self-inspired and indigenous organisation which was helped forward and fostered by voluntary local agency which deals with locally grown produce for the exclusive benefit of the village agriculture. Nothing is introduced from outside and by outsiders.

OUR GEOLOGICAL TOUR.

BY

RAMA CHANDRA (I. Ag. CLASS).

As has been customary, the I. Ag. Class this year also was divided into two batches, the first of which consisted of 31 students was led by Prof. Sahasrabuddhe and Mr. Gokhale. The special feature of the tour this year, as never before in the history of such tours, was that the only lady student in the College was one of the party. The long-cherished desire for the tour was fulfilled on the 3rd of November 1927 when at 11-50 p. m. the train whistled out of the Poona Railway Station We had a reserved compartment for ourselves, so all the luggage and the owners were dumped in it. After about an hour or so of incessant noise every one began to feel like sleeping but no sooner had one said "good-night," than he was greeted with a happy "good-morning," so much so that for the most part of the night no body was allowed to sleep. By 9'00 next morning we were at KirloskarWadi where one of the officers of Kirloskar works met us and took us to the Theatre hall where we were to stay that day.

After a refreshing bath and a hearty breakfast we were taken in three batches round the factory. The factory is well equipped with the most up-to-date machinery. As it is beyond the scope of this short note to go into every detail of the working of the various departments, suffice it to say that the factory is self-sufficient and carries on all sorts of works from the, smelting of pig-iron, moulding, grinding and painting of ploughs, sugar-cane crushers etc. in fact all the requirements in agricultural machinery to the advertising of its work for which a German Electric Press has been installed.

In the afternoon we were entertained to a sumptuous tea by Mr. Kirloskar who also gave a remarkable account of his works from its very conception to the present day and after expressing our thanks we dispersed to find ourselves on our beds under the electric lights.

Morning, and we were on the move. Nine o'clock and we were in the train after three hearty cheers to Mr. Kirloskar. By 2'00 p. m. we were at Gokak Road. We made ourselves comfortable in the Dharmasala and after meals we went out to see the rocks and returned at about 6. 00.

Next morning six o'clock punctually we were out for the Gokak falls and quarries amidst the left and right of the front lines

and the hissing of songs in the rear. 7 o'clock found us near the falls where the river Ghatapprabha trimphantly dashing and beating the rocks on the sides meets with a merciless fall of 180 feet, High above the river on both sides are huge masses of sandstone rocks looking angrily down upon the river as if to devour it up but the humbled river flows gently on kissing the rocks at their feet. We walked for about 4 miles beyond the falls seeing various rocks, minerals, strikes, dips, folds and dykes and at about 10-30 after a little rest and refreshment returned. We reached the falls and crossing the river on a suspension bridge built by the Gokak Mills Ltd. we bathed ourselves in the refreshing water and returned with high spirits to the Dharmasala.

We left Gokak Road in the morning and got down at Khanapur at noon. We went for a bath off the Khanapur Distillery, the mere sight and smell of which intoxicated some of our party and sent them to the dreamland.

We had our meals at 2-30 and after a little rest started off to explore the unknown regions (unknown to most of us) for Granites which we did find. After collecting a few samples we found ourselves again at Dharmasala. Night passed on as usual and the next morning we visited the Distillery where different processes in the manufacture of liquor from molasses and moha flowers were demonstrated by one of their officers.

We left Khanapur at noon and reached Dharwar in the evening. As usual we made our way to the Dharmasala and slept for the night. Next morning at 7·00 we were on the march to the Dharwar Experimental Farm where the Superintendent Mr. Shevade took us round the Farm and gave us a general but useful idea of the work done there, while Mr. Kottur, the Cotton Breeder, explained with great enthusiasm his experiments on cotton and success thereof and Prof. Kulkarny, cotton mycologist showed us his laboratory and the fungus and other diseases he was combating with. The evening invited us to the beds of Shale near-by. The night was spent quietly and next morning we were again afoot for Gadag.

We reached Gadag at 12.00 and after having eaten something we went out to see a Granite rock said to have been newly discovered about 3 miles out of the city. We marched for about 3 miles and on enquiry from the guide who was with us, we found that it was yet 1½ miles off. On completing that distance we found that we would have to go yet another half a mile before we could

reach the destination. It now transpired to me that the miles of ours are but furlongs to the people of those places!

However among the Jowar fields we found a newly-dug piece of rock. But it was not granite, it was a sample of Gneiss. We collected samples and as it was becoming dark, we retraced our steps to the Dharmasala. Next morning we were out to see the Haematitic Quartzite and on the way picked up some Iron Pyrites or Fool's gold as it is called.

We left Gadag early next morning and were at Badāmi at 8. After morning tea we at once walked off to see the remnants of the forts and caves about 3 miles off the station. We came back and again after breakfast were in readiness for the train for Bagalkot.

We arrived at Bagalkot at 4-30 p. m. and were asked to make the best use of-not the Dharmasala this time but—the Cotton Godown. We refreshed ourselves with a bath and at night assembled on the lawn outside to have a sort of a singing party. Every one was made to sing and sing did every one in his own way without any concern for the rest of the party. Some recited some verses from some book, some began to sing love songs and nothing else, while some thought it fit to imitate another of his own kind.

Next morning we went out and crossing the river Ghataprabha in a boat collected Jasper and samples of Quartzite and while some returned in the boat, others of the heroes volunteered to cross it on their breasts and they did.

We left Bagalkot at night and in the biting cold breeze of the morning arrived at Bijapur—the last place of our visit. The day was spent in seeing the remnants of an ancient kingdom. The grand structures of towers, domes and guns bear a full testimony to a civilization of long ago in no way inferior to the present one. Tombs of mighty kings we visited and mighty they were but now a mighty mass of nothing they are, beneath the big monunents erected over their graves.

The evening found us in the museum where the remnants of the ancient civilization and glory of Bijapur invite students of History to learn something of them. The famous whispering gallery was next visited and if anything, every one was struck with awe beyond imagination. We left Bijapur at 4-30 a. m. for Poona arriving there at 4·00 the same afternoon.

Thus we finished the cycle of 12 days in happiness and joy chiefly through the paternal care and guidance of our Professors and we sincerely thank them for it.

COLLEGE NEWS AND NOTES

The College reopened after a full month's vacation on the 1st November and, soon after, the I. Ags. and the Senior B. Ags. went on their usual Tours. The special feature of this year's Senior B. Ag. Agricultural Tour was the trip to Konkan for which the students are deeply indebted to Prof. V, G. Gokhale. We are sure that the practical knowledge gained during this tour will help the students not only to get through the examination, but also to solve many practical difficulties that may be met with in future life while following this profession.

* * * *

We are very sorry to note that Dr. Mann, Director of Agriculture, has retired from Govt. service. He was the Principal of this College for a long time and the splendid status of our College is mostly due to him. A fare-well party by the staff and students was given to him and an album of the students and staff was presented during that occasion. We take this ospportunity to express our heart felt appreciation of the wo k he has done in the College and in the Bombay Presidency and we wish Dr. and Mrs. Mann a well-earned and happy rest in their dear old England.

* * * *

We heartily welcome back Dr. Burns, Principal of the College who was off for 1½ years as Joint Director of Agriculture. Rao Bahadur P. C. Patil, who was the Acting Principal in Dr. Burns' absence has reverted to his post as Professor of Agricultural Economics. We are extremely glad to note that Rao Bahadur Patil, during his tenure of office as Principal, rose to the occasion and won the esteem and love of all who came in contact with him.

* * * *

Prof. V. G. Gokhale, who was acting as Professor of Agriculture during Prof. Patel's leave, left us on the 26th November to join his old post as Deputy Director of Agriculture, Konkan. Though his stay with us was short, he has impressed his personality on all the students. With a paternal care he looked after the students and all of us are indeed highly grateful to him. A farewell party was given to him on the eve of his departure and we are sure that he will have a corner of his heart for the students and staff with whom he mingled freely. We wish him all glory and happiness and may God bless him with a long life.

* * * *

Prof. Patel who was away on leave has joined duty as Professor of Agriculture and we welcome him again heartily to our midst. We are sure that he would widen our knowledge by imparting to us all the information that he has been able to gather during his late tour.

* * * *

Mr. R. B. Deshpande, B. Ag. is selected for Research work in Botany in the Agricultural Research Institue Pusa and we wish him all success in the new line he is following.

GYMKHANA NOTES.

Since the publication of the last issue, our activity was mainly confined to the Inter Collegiate Sports. From the list given below it can be seen that our College has returned with flying colours and we are proud to declare that the College Championship Cup was won by us this year.

We are very glad to remark that our only lady student was first in the swimming competition. We offer our hearty congratulations to one and all of the prize-winners,

The Tennis season is fast advancing and symptoms of this are seen in the Tennis Court. We hope that in this item also we will never lag behind.

LIST OF PRIZE WINNERS FROM OUR COLLEGE IN THE INTER-COLLEGIATE SPORTS, 1927-28.

Cricket	Captain	Mr. Ghorpade
Basketball	„	„ Don Eugene
Volleyball	„	„ Don Eugene
Relay Race	„	„ Bhide N. R.
Tug-of-War	„	„ Irani R. A.
Football	„	„ Kanagasabai

Tennis Doubles Messrs Menon M. C. & Desai D. G.

„ Singles Mr. Menon, M. C.

Putting the Shot	Mr. Irani B. A.
Cross Country	„ Bhide N. R.
120 Yards Hurdles	„ Bhide N. R.
Fast Walking	„ Pandya S. B.
Throwing Cricket-ball	„ Dongre S. D.
Wrestling Middle weight	„ Vipat
Fast Cycling	„ Modak P. A.
Ladies Swimming	Miss Rajubai Gujjar

B. ISHWARLAL.
Hon. Gen. Secretary.

LIST OF BOOKS.

J. Coatman—India in 1925-26.
.... Famine Relief Code Bombay Presidency, 1927.
.... Royal Commission on Agriculture, Vols. I to IX.
.... Report on Public Instruction in the Bombay Presidency for 1924-25 and supplement to it.
.... Catalogue of books of the Bombay Natural History Society.
S. K. Iyengar—Studies in Indian Rural Economics.
K. S. Kelkar—Never Get Ill.
.... Report on the Bombay Presidency Agricultural Show held at Poona in 1926.
.... Album of the Bombay Presidency Agricultural Show.
S. Sen—Administrative System of the Marathas.
B. S. Kolhatkar—Physiography (In Marathi).
Indian Mohamedan—British India.
R.B. Forrester—Report upon Large scale cooperative marketing in the U.S.A
.... Map of Poona District.
J. L. Buck— An economic and social survey of 150 farms, in China.
.... Agricultural Research and Administration in the Non-self Governing Dependancies.
.... Marketing and preparing for market of foodstuffs produced in the overseas parts of the Empire 1st Report.
.... Proceedings of the South and East African conference held at Nairobi 1926.
.... Album of the Photos of various sections in the College.
.... Notes on paper making in Egypt.
H. Myrick—Rural credits system.
.... Report of the 5th Indian Science Congress 1918.
.... Proceedings of he 6th Indian Science Congress.
.... Do. 10th Do.
.... Do. 11th Do.
.... Do. 13th Do.
D. B. Parasnis—The Sangli State,
J. Clibborn &c—Report on Industrial Education Pt. I.
V. S. S. Iyer—Mysore, Industrial and Commercial in 3 Parts.
A. W. Richardson—The Nation and Alcohol.
P. R. Venkatasubrahmanyan—Studies in Rural Economics.
J, A. Finch—Health and Happiness.
N. J. Readymoney—Science of Nature History.
B. Tompkins—Springs of Water and how to discover them by the Divining rod
P. J. Lancelot Smith—Test papers in Physics.
C. R. Mann—The Teaching of Physics.
E. H. Griffiths—Therma; Measurement of Energy.
W. N. Shah—Air currents and Laws of Ventilation.

R. T. Glazebrook—Mechanics.
R. H. Jude &c—Physics Vol. I.
J. S. Taylor—Theoretical Mechanics.
M. A. Codd—Electric Wiring diagrams for motor vehicles.
.... Manual of Map Reading and field sketching.
.... Buildings and general Vol. I and II.
.... Roads Vol. III.
.... Electrical, Mechanical and Water Supply.
.... Preliminary Report of An Investigation into the artificial drying of crops in the sack.
F. I. Anderson—Electricity for the farm.
F. G. R. Wilkins—Elementary Heat and Heat Engines.
A. H. Hains &c—Surveying and Building construction Pts I and II.
H. Adams—Practical Surveying.
J. Malcolm—Agricultural Surveying.
K. M. Nadkarni—The Indian Materia Medica.
J. M. Coulter—The Evolution of sex in plants.
W. E. Brenchley—Inorganic Plant Poisons and stimulants.
S. L. Vaidya—School gardening (In Marathi).
S. L. Vaidya—Orders of herbs (in Marathi).
B. L. Robinson &c—A handbook of the Flowering plants and Ferns.
J. Eriksson—Fungoid Diseases of Agricultural Plants.
A. J. Perold—A Treatise on Viticulture.
W. H. Chandler—Fruit Growing.
L. R. Hesler &c—Manual of Fruit Diseases.
C. Chupp—Manual of Vegetable Garden diseases.
H. A. Spoehr—Protosynthesis.
F. Summers—Factors governing bud formation.
W. H. Rankin—Manual of Tree Diseases.
L. Doncaster—An Introduction to the study of Cytology.
F. D. Heald—Manual of Plant Diseases.
.... Papers presented at the International Conference on flower and fruit sterility 1926.
A. B. Smith—Poisonous plants of all countries.
.... East African Pasture plants.
J. C. Fabriciles—Attempt at a dissertation on the diseases of plants.
G. N. Calkins—The Protozoa.
A. Jprgeveen—Micro organisms and fermentation.
Svedberg—Colloid Chemistry.
A. Harvey—Tanning Materials.
E. J. Russell—The Micro organism of the soil.
H. E. Cox—The Chemical analysis of foods.
S. A. Wakeman &c—Enzymes.
P. Woscroft—Inorganic Chemistry for upper forms.
G. B. Kolhatkar—Inorganic Chemistry Pts I and II.
J. Read—A text book of Organic Chemistry.
R. Benedikt—The Chemistry of the coal tar colours.
G. S. Apte—A dictionary of chemical reactions.
A. N. Meldrum—The Development of atomic theory.
H. M. Lefroy—Report on an inquiry into the silk industry in India in 3 parts.

H. H. Aitken &c—Plant Pests and Plant Diseases.

J. O. Westwood—Introduction to the modern classification of Insects 2 volumes.

W. Kirby—Introduction to Entomology 2 volumes.

A. S. Packard—Life Histories of Animals including man.

W. A. Harding &c—Hirudinea.

.... Annual Report of the Indian Central Cotton Committee for 1926.

.... The ideal fertilizer for paddy.

A. J. Turner—Technological Reports on standard Indian Cottons.

.... Report on the Investigation into the finance and marketing of cultivators' cotton in Khandesh.

.... Report on an investigation into the finance and marketing of cultivators' cottons in North Gujarat.

W. J. Malden—Actual Farming, its progress and practice 3 volumes.

C. Turnor—The Land and its problems.

F. App &c—The Farmer and his farm.

A. Cranovsky—Land problems in Palestine.

.... Proceedings of the 4th International Conference on Soil Science held at Rome in 3 volumes.

W. Crookes—The Wheat Problem.

J. A. Murray—The Science of soils and manures.

H. J. Waters—Essentials of New Agriculture.

W. A. G. Penlington—Science of Dairying.

A. Ward—The Encyclopedia of food.

E. C. Branson—Farm life abroad.

T. R. Pirtle—History of the Dairy Industry.

W. Powell—owen—Rabbit keeping on money making lines.

H. W. Jackson—Artificial incubating and brooding.

J. H. Drevenstedt—Standard bred Wyandottes.

T. Morgan—The Storage of eggs.

W. P. Bloxam &c—An account of the Research work in Indigo.

.... Abstracts of the Proceedings of the 1st International congress of soil science 1927.

B. S. Pharate—Dry Farming (In marathi).

Department of Agriculture, Bombay

LEAFLET No. 7 OF 1927

Iron Mhots for raising Water

The usual method of raising water from wells and rivers by bullock power has always been by means of the leather *mhot*, in all parts of the Bombay Presidency except the Konkan and Sind, where the Persian Wheel is preferred. But it has always been recognized that leather was not the best material for making these *mhots*. It rapidly perishes and developes cracks, while when wet it increases very much in weight. In recent years, too, the increase in the price of leather has made it more and more necessary to find some other material out of which the *mhot* should be made.

The Iron Sangli Mhot

One of the first attempts to make an iron *mhot* to replace that of leather is what is known as the Sangli *mhot*, introduced by Messrs. Bhide and Sons of Sangli about 1910, and now widely used in the Bombay Presidency, especially in Khandesh. The action of this is a very close imitation of the leather *mhot*, and the emptying is brought about, as with the leather *mhot*, by a subsidiary rope which pulls the lip of the container on to the discharging platform and holds it there. The weakness of this pattern is, however, the valve by which water is admitted to the *mhot* at the bottom of the well. This always tends to leak, and very often is apt to stick. It has sometimes been objected that this *mhot* may catch the walls of the well and be damaged, more especially with brick wells. To avoid this, it is necessary that the Wadhwan and *kana* (roller) should be fixed sufficiently forward to allow free movement of the *mhot* without danger of catching the wall.

This iron *mhot* will last at least as long as the leather *mhot* and can be easily repaired by the ordinary village blacksmith. To work it, no alterations are needed in the usual structures at the head of the well, save that the wooden fittings (Wadhwan) and roller (*kana*) must, as already stated, be fixed far enough forward to prevent the *mhot* from striking the sides of the well.

Other designs not differing widely from the Sangli *mhot* have been put forward, more especially modifying the valve for the admission of water, but nothing with any *essential* change in design. These have on the whole been very successful, compared with the old leather *mhot*; almost everywhere they have been introduced, and, as already stated, are now widely employed in Western India. They are usually made in sizes which hold 35 and 45 gallons of water respectively, designed for use with one pair of bullocks, and in a larger size holding 55 gallons of water designed for use with two pairs of bullocks.

The "Skeen" Irrigation Bucket

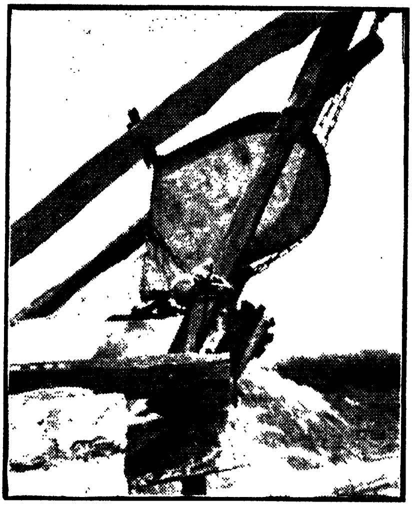
A new type of *mhot*, based on novel principles, has recently been introduced by Mr. H. Skeen of Bangalore, and the tests so far made show that it is a really successful attempt to overcome the drawbacks of previous iron *mhots*. It is *valveless*, and its action is controlled by a pulley firmly attached to the bullock yoke. It eliminates the loss by leakage and waste of time due to the valve. It is not centrally hung, but its weight is divided evenly between the two ropes usually employed, and this, naturally, means that lighter ropes can be used. It can also be readily installed on any well that is now employing either a leather or iron *mhot* without the need of alteration of the structures at the head of the well. Any specified size of Bucket can be supplied, but 38-gallon is the standard size.

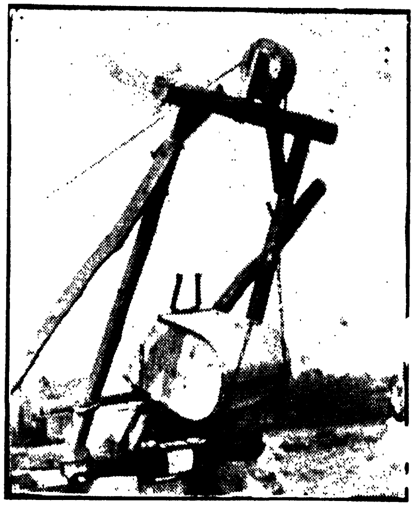
It is designed so that when it reaches the water it capsizes and immediately fills through the mouth. Tests made on the Agricultural College Farm, Poona, show that it will fill in two to three seconds. The *mhot* attains a vertical position as soon as it is filled, and it can then be immediately pulled up by the bullocks. On the arrival of the bucket at the discharging platform, the control pulley exerts its influence, and the water is discharged over a bamboo tipping bar fastened just behind the usual roller. The tilting is due to the shortening of the upper rope and the lengthening of the lower rope, through the control pulley, as the animals move forward. It then automatically descends for reloading without the need for any assistance or muscular action by the driver.

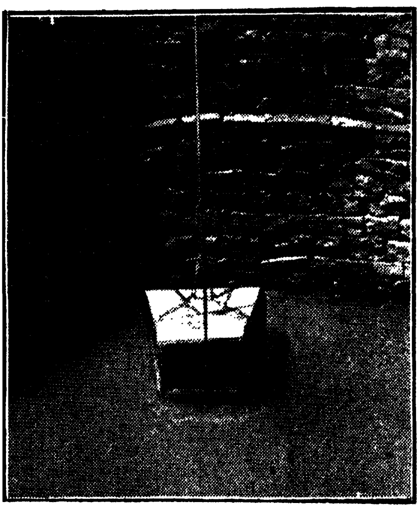
The chief advantages of this design are:—

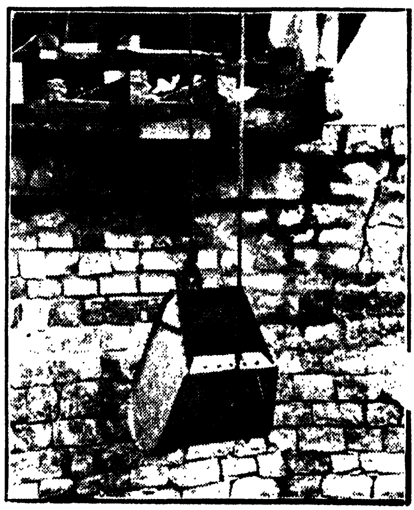
1. The introduction of the control pulley makes the whole very much more automatic than that of the

Sangli Mote.









ordinary *mhot.* Hence a less experienced driver is required, and a boy can usually do all that is needed.

2. The main load line is kept low and well down into the animals' necks, owing to the load being evenly divided between the two suspension ropes.

3. Though the bucket is light in design, yet the absence of a valve and the method of hanging it make it very much less liable to damage, all weight loads and wear and tear being borne by the chain slings in which the container is cradled. And the fact that it is made of galvanized iron renders it less liable to rust. The result is that it will last for a long time.

4. The bucket fills quickly and empties quickly and there is a distinct saving of time on this account.

5. There is no leakage during the raising of the bucket.

6. This pattern Bucket, and the pulley, can be used for other purposes on a farm when not required for water-raising from a well.

The Sangli Iron Mhot can be obtained from Messrs. Bhide & Sons, Sangli.

The "Skeen" Irrigation Bucket can be obtained from the inventor, Mr. H. Skeen, Sydney Road, Bangalore.

PRINTED AT THE YERAVDA PRISON PRESS, POONA

Department of Agriculture, Bombay

LEAFLET No. 8 OF 1927

Agricultural Machinery and Agricultural Engineering

Introduction

For agricultural work there are various sources of power. There is, first of all, the energy of man himself which he applies when he uses hand implements. Then there is the energy of the bullock, which has uptill now been the main additional power used in Indian agriculture. More and more, however, people are beginning to use the energy contained in coal, oil, petrol and gas. To apply the energy in these fuels to any purpose we must have machines, and we must know how to use them. Such machines, for example, are tractors and the engines that drive pumps.

How to get advice

If you want advice regarding agricultural machinery or engineering, write to the Agricultural Engineer, College of Agriculture, Poona. He can tell you whether it will be wise or not for you to instal a machine, what kind of machine to get, how to get it and what it is likely to cost. Before he can do this, however, the Agricultural Engineer must be in possession of certain information. Hence when writing to him give him the particulars according to the heads mentioned in Appendix I.

Care of Machines

One constantly sees machines which have been damaged through ignorance or negligence. A well-made machine will last a long time and give splendid service if the owner knows what treatment it requires and sees that it gets that treatment. For the guidance of owners there is given in Appendix II a series of short notes on the management of certain kinds of machines.

Boring

To get a bore made, write either to the nearest Deputy Director of Agriculture for one of the machines belonging to the Agricultural Department or address your Mamlatdar for one of the machines worked under the guidance of Revenue Department. Some district local boards have these machines at their disposal and application should be made to such local boards. There is a separate leaflet dealing with boring available on application.

APPENDIX I

General Procedure of the Agricultural Engineer's Department

1. When enquiries are addressed to the Department they are answered immediately and if sufficient data are sent, advice and estimates are given and if sufficient particulars cannot be given by the applicant, an inspection of the site is made free of cost.

2. If the enquirer wishes to act on the advice given, he can either take the estimates to the makers and make his own arrangements with them for the purchase and erection of the machinery he wishes to instal, or, if he wishes it, the Department will undertake the work for him.

3. In this case, he is required to pay into this office, before the work is commenced, such a sum as will cover the cost of the machinery and necessary sundries, and also a charge for erection, which is fixed roughly in proportion to the amount of the estimate and work to be done.

4. Full drawings are then prepared and the machinery purchased and erected by the Department, the enquirer having to provide all building material and labour for same.

5. The machinery is started and handed over in good working order to the owner and an account of all expenditure submitted to him. Any unexpended balance from the amount paid into this office is refunded and the transaction closed. The Department is afterwards always ready to give further advice and to undertake any repairs, but takes no responsibility for the working of the plant, which is left entirely in the owner's hand.

6. Broadly speaking, the policy adopted by the Department is to advise and to assist those who have some sense of self-help and business like methods; not to endeavour to bolster up an artificial industry by thrusting gifts on the helpless and unenterprising who will not take advantage of them.

7. It is useless for a man to have machinery unless he has some intelligence, a good deal of industry and sufficient capital to make the best possible use of it; where these conditions are wanting, the purchase of plant is never recommended. Specimen forms A, B, C and D are attached for pumping sites.

FORM A

Points to be considered in selecting PUMP SITES on a River Bank

1. It may generally be considered that pumping will not be profitable if the total height, from the lowest level of the river in dryest season up to the highest point of the land to be irrigated, is more than 50′. The less this height, the cheaper pumping will be, and in selecting a site, one should always be looked for *where this total lift is as low as possible.*

2. If possible, find a site *where the land is nearly level, right up to a steep bank.* In this case, the water can be pumped up and delivered close to the edge of the bank, and from here it will flow by gravity over the whole land to be irrigated. When the land *slopes up* for a long distance away from the bank, it is necessary either to pump the water through a long and expensive pipe to the highest point, or to make a high bank with a water channel on the top to carry the water from the pump to the highest point; in both cases an expensive arrangement.

3. The land should of course be good cultivable soil and as nearly level as possible. Uneven ground is not suitable for irrigation and must be levelled as well as is practicable.

4. A good site for the pump should be found on the bank, as close as possible to the dry season water level, but at the same time *just above the highest water level at which pumping will be required.* It does not matter if the pump is immersed by high floods when it is not required to work.

5. Having found the pump site, a suitable place for the engine must be found. This should be on the high bank above all flood levels; but at the same time within 20′ or 15′ of the pump site.

FORM B

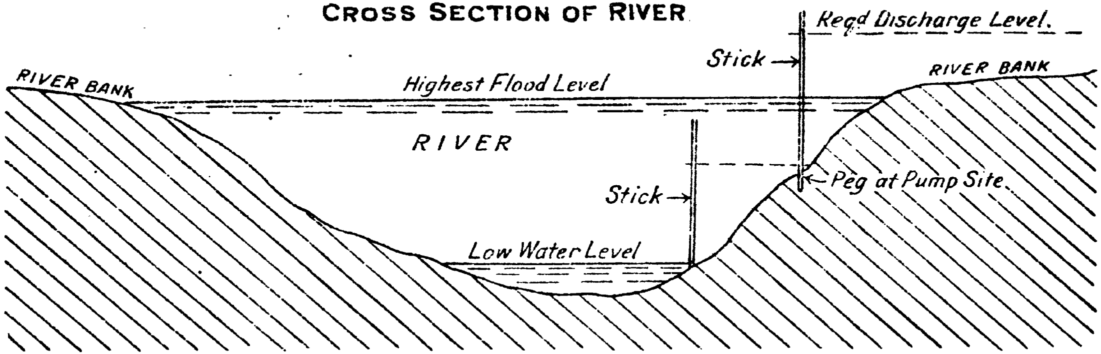
Particulars required of Pump Site

6. First drive a stout wooden peg into the river bank at the place where you think the pump might be placed and *measure all the heights* and *distances asked for from this peg.* Keep the peg in the ground for inspection, in case an officer is sent to examine your site.

Note.—Questions 1 to 5 are *vertical heights,* that is, measured straight down, as a stone would fall in the air.

7. When places are *below* the peg, the levels can be measured roughly by standing upright *at the place* a long stick, and stretching a line from the stick to the peg, as nearly level as you can guess; then measure the stick up to this line. Or if the place is *above* the peg, stand the stick *on the peg* and stretch the line, as level as possible, from the stick to the place; then measure the stick up to the line. See sketch on next page.

CROSS SECTION OF RIVER



Questions 6 to 8 are *dist nces* measured with a tape *along the ground.*

WANTED :—

1. The *vertical* height from the peg to the lowest water level known in the last 20 years.
2. The *vertical* height from the peg to the present water level.
3. The *vertical* height from the peg to the highest flood level known in the last 20 years; (say whether it is above or below the peg).
4. The *vertical* height from the peg to the highest water level at which it would still be necessary to pump.

That is to say, you might have a flood running down the river but no rain at your place. It would then be necessary to pump and irrigate your land. I want to know this highest water level you have ever known during a long break in the rains, when you would need to pump.

5. The *vertical* height from the peg to the place where you wish to lift the water, in order to irrigate your land; that is, to the delivery point of the pump pipe.
6. The *distance*, measured along the bank, from the peg to the present water level.
7. The *distance*, measured along the bank, from the peg to the point on the bank where the highest flood level reaches.
8. The *distance*, measured along the bank, from the peg to the place where the water is to be delivered by the pump.
9. The quantity of water now required (say number of mhotes required working 8 hours per day, or number of acres of each crop to be irrigated *each year*).
10. The estimated greatest supply available in the dryest season (say number of mhotes working hours per day).

W. M. SCHUTTE,
Agricultural Engineer, Bombay, Poona.

FORM C

Particulars required when advice is asked as to pumping from Wells

NOTE.—All levels should be measured *from ground level.* If the well-wall is built up above ground a mark should be made inside the well at ground level and all levels measured from this mark.

1. Highest water level during rains.

2. Water level during a break in the rains when pump is still required (before working mhotes).

(That is to say, during a break in the rains, you might have high water in your well but no rain. It would then be necessary to pump and irrigate your land. I want to know this highest water level you have ever known during a break in the rains, when you would need to pump.)

3. Water level after a full day's work in rainy season. (State number of hours and mhotes worked per day.)

4. Lowest water level in dry season (*before* working mhotes).

5. Lowest water level in dry season *after* full day's work (state number of hours and mhotes worked per day).

6. Total depth from ground level to the bottom of well.

7. Height of well-wall above ground level.

8. Desired height of delivery above ground level.

9. Diameter of well (inside).

10. Total quantity of water now required per day (say number of mhotes working 8 hours per day, or the area of each crop it is desired to irrigate *each year*).

11. Nature of crops to be irrigated and area of each.

12. Estimated greatest capacity of the well in dry season (say number of mhotes working 10 hours per day).

Replies to questions 1 to 9 should be shown on the attached diagram and then returned to me together with replies to the other questions 10 to 12.

W. M. SCHUTTE,

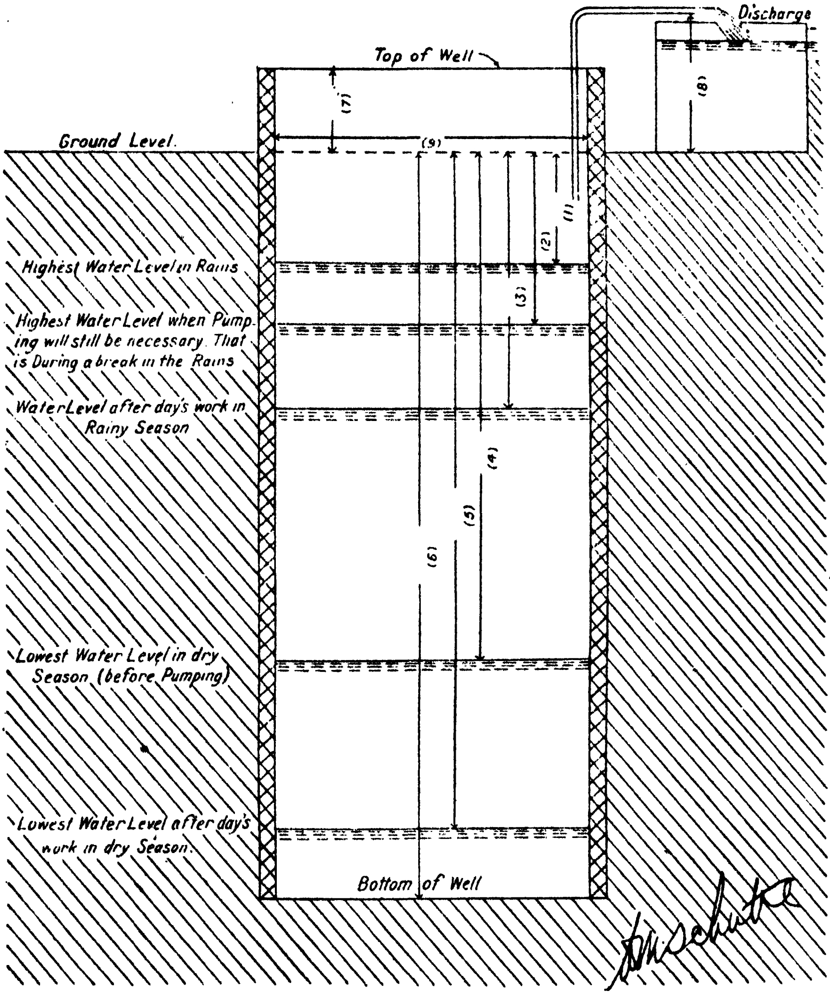
Agricultural Engineer,
Bombay, Poona.

FORM O

CROSS SECTION OF WELL.

SHOWING PARTICULARS REQUIRED IN ESTIMATING FOR PUMPS

NUMBERS (1) ETC REFER TO QUESTIONS IN ATTACHED FORM C.



Agricultural Engineer.
Bombay,
Poona.

Questions to be answered by the Applicant

Pumping

1. How many acres do you want to irrigate?
2. What kind of crops do you wish to grow?
3. What is the source of water, well or river?
4. Do you or any member of your family know how to drive an engine and pump?
5. How far is your site from the nearest railway station?
6. Is the road metalled or simply a cart track?

Tractoring

1. How many acres do you want to plough per season?
2. How many working days are there in the season?
3. Have you any one who knows how to drive a tractor and attend to repairs?
4. Is the land level or undulating?
5. Is the soil red in colour or black?
6. Are there any tree roots or rock in the fields?
7. Is the fuel such as kerosene or crude oil easily obtainable?

Grinding Mills

1. What kind of grain do you wish to grind?
2. What quantity per hour? (to be given in lbs., cwts. or local weight).
3. What is the source of power, oil engine, gas engine or steam engine?

   If in a town, can you get electricity to drive a motor?
4. Do you want a mill with steel grinding plates or stones?

Oil Mills

1. What kind of seeds do you wish to grind?
2. What quantity per day in lbs., cwts. or maunds?
3. Have you an engine or motor to drive the mill or do you wish to use bullocks?

Cane Crusher

1. How many tons of cane do you wish to crush per hour or day?
2. How many hours do you wish to run the crusher per day?
3. Do you want a bullock-driven mill, or engine-driven mill?
4. If engine-driven mill, what kind of engine do you want? Oil, gas or steam?
5. Have you any one who knows how to drive an engine and attend to the mill?
6. Do yon want a fixed mill or one that can be moved from place to place?

Threshing Machine

1. What kind of grain do you want to thresh, wheat, jowar or bajri?
2 What quantity do you want to deal with per day?
3. How many working hours per day?
4. What power have you to drive the machine?
5. Do you wish the machine to be portable or fixed?
6. Have you any one who knows how to drive the machine and do petty repairs?

Groundnut Sheller

1. How many acres have you got growing this crop?
2. How many maunds do you wish to deal with per day?
3. How many working hours per day?
4. Do you want a hand-driven machine or power-driven machine?
5. Do you want a fixed machine, or portable machine?
6. Have you an engine or bullock gear?

Cotton Gin

1. Do you want a roller-gin or a saw-gin?
2. How many lbs. do you want to deal with per day?
3. How many working hours per day?
4. Do you want a single-roller or double-roller gin?
5. Have you any power, such as oil engine, or steam engine?
6. Have you any one who knows how to adjust the knives on a roller-gin or the saws on a saw-gin?
7. Are there any mills near your place?
8. Is the cotton long-staple or short-staple?
9. What is the variety of cotton you wish to deal with?

Chaff Cutters

1. Do you wish to cut wheat, straw, kadbi or hay?
2. How many maunds or lbs. per day do you wish to cut?
3. Do you want a hand-machine or power-machine?
4. In the case of a power-machine have you any engine or bullock gear?
5. Do you want an English mill or an Indian make of machine?

For any other machine please state the kind of operation, the crop and the soil. Advice will then be given and a visit to your site will be made if necessary free of cost.

APPENDIX II

Important Instructions to Engine Drivers

1. The man employed to work the engine will be termed the "Engine Driver" and should not be referred to as a fitter, as this leads to confusion.

2. The driver should enquire each evening at what time the engine will be required the next day, and he must be in attendance at least one hour before that time to clean and oil the engine before starting.

3. All bright parts are to be kept thoroughly polished with oily waste.

4. All wearing surfaces such as valve, spindles, etc., should be thoroughly cleaned with clean waste and paraffin but not oiled. They should not be touched with emery cloth.

5. The lubricators on all bearings should be kept thoroughly clean and the supply hole kept clear, so that the oil will flow regularly on to the bearing.

6. The lubricators should be taken off once a week, the cups thoroughly washed out with paraffin and the lubricators then replaced and adjusted.

7. Only two sorts of lubricating oil should be used on the engine. For all lubricators on bearings, etc., the proper "lubricating oil" supplied must be used and for the cylinder lubricator the "cylinder oil".

No cocoanut oil or castor oil should be used or purchased

8. The exhaust valve should be taken out once a week, thoroughly cleaned with paraffin and then carefully ground on its seat with emery powder.

9. The engine driver is not to leave the engine shed on any account while the engine is running. He should have his food brought to him or arrange to take it when the engine is stopped.

10. The officer in charge of the station or farm in the case of Government-owned plants, is required to see that these instructions are carried out by the driver.

Instructions for Starting Engine

1. Before getting ready to start the engine all the cleaning of the engine should be finished.

2. The lamp for heating the vaporiser may then be lighted and placed in position under the vaporiser.

3. While the vaporiser is being heated the lubricators can be filled up.

4. See that the oil tank is full and quite clean.

5. Test the oil pump by hand to see that it works properly.

6. When the vaporiser is at dull red heat, open all the lubricators and pull the fly wheel round. The engine should then start easily.

Stopping Engine

1. Turn off the lubricator of the cylinder.
2. Turn off the supply of fuel oil.
3. Leave the engine standing with the crank at the bottom of compression stroke.

A few notes on the Management of Machines used in Agriculture

Cleanliness and efficient and timely lubrication to each of the moving parts of the machine are important points a user has to bear in mind, howsoever insignificant a machine may be. The entire life of a machine depends upon how it has been handled and cared for. If sufficient precautions have been taken to keep it clean and well-lubricated a great proportion of further trouble can certainly be saved. In high-speed machines, such as tractors, small oil engines, chaff-cutters, disintegrators, mills, bruisers, blowers, etc., lubrication plays an important part as the least bit of carelessness is likely to cause breakdown as a result of over-heated or melted bearings.

The quality of lubricant used is also an important point. Only the best should be used.

Correct alignment of belting, right speed, tight joints, efficient cooling in case of internal combustion engines are also important points to be considered to ensure the satisfactory and successful running of a plant.

The important factor in the management of machines is an efficient attendant or driver who knows his work thoroughly, is proud of his machine, and is sufficiently observant and energetic to do everything that is wanted to keep it in sound working condition without any loss of time.

Cultivators are requested to join the oil engine class which is held at the Agricultural Engineer's workshop. The tuition is free and the course lasts for a period of three months and during the course all the points enumerated above are taught in a practical manner.

PRINTED AT THE YERAVDA PRISON PRESS, POONA.

Department of Agriculture

LEAFLET No. 9 OF 1927

Manures for the Tobacco Crop in Gujarat

With the extension of tobacco cultivation, the supply of farm yard manure is already tending to be short and it has become an urgent matter to find a method of manuring which will give a similar yield to the ordinary dressing of farm yard manure at a lower cost and without lowering the quality of the tobacco grown. The most likely method of doing this has seemed to be the use of a green manuring crop and the conditions of tobacco cultivation seem to be such as to be specially suitable for this method.

The complete replacement of farm yard manure with a green manure crop like sann hemp has not been a success both as to yield as well as the quality of the produce.

Farm Yard Manure with Sann Hemp as a Green Manure Crop

A much more profitable use for a green manure crop of sann hemp is to be found in employing it in *partial* replacement of farm yard manure and the results which follow show how far this is likely to be valuable. Two plots were taken up, one with normal dressing, 20 cart-loads of farm yard manure per acre, and the other with half this quantity (10 cart-loads), supplemented by a crop of sann hemp. The actual method of carrying out this system of manuring is as follows:—

> Ten cart-loads of farm yard manure are spread on the land after the first rains, and the sann hemp seed is broadcasted at the rate of 100 lbs. per acre. Then the land is ploughed with the country plough twice, in cross directions and the *samar* or plank taken over the lands. The sann hemp grows vigorously and is ploughed in by an iron turnwrest plough on August 1st. The *samar* is then again taken over the lands. Ten days later the land is prepared for tobacco as usual, and the tobacco is generally transplanted about the last week in August.

The results of this method of manuring on the yield of tobacco, as against the more usual method of adding twenty

B 1904

cart-loads of farm yard manure per acre, in each of the last five years, are as follows:—

Yield of Tobacco per Acre

		20 carts farm yard manure per acre.	10 carts farm yard manure per acre and sann hemp.
1922-23	...	975 lbs.	967 lbs.
1923-24	...	1,232 ,,	1,283 ,,
1924-25	...	1,488 ,,	1,551 ,,
1925-26	...	1,572 ,,	1,370 ,,
1926-27	...	1,349 ,,	1,334 ,,
Average	...	1,323 ,,	1,301 ,,

It will be seen that the yield in every year except 1925-26, after the treatment was established, was greater or equal with the green manuring treatment to that obtained with the larger amount of farm yard manure. In this year 1925-26, there were no rains for rotting the green manure. There was no difference in the quality of the tobacco produced. By this method the cultivator can at least get similar profits at a saving of cost by Rs. 15 per acre, and this can crop double the area with the tobacco crop with a limited supply of farm yard manure, provided bullock labour, etc., be available.

Concentrated Manure for Tobacco in addition to Farm Yard Manure

Tobacco is the only money crop of the Charotar tract to which the more progressive cultivators have turned. Thus if any concentrated manure which would in every season give higher profits by its application, and if such a manure be easily available, there is considerable scope for its general adoption.

The experiments described below definitely indicate that castor cake is admirably suited for both these purposes, *viz.*, that (1) it increases the profits every year and (2) that it is readily available.

The experiment was first conducted with a heavy dose of the manure, namely, 600 lbs. of powdered castor cake per acre applied at the time of the first irrigation. In the field in which this manure was to be applied only twenty cart-loads of farm yard manure per acre were applied as against thirty cart-loads of farm yard manure per acre. The yields obtained were as follows:—

Yield of Cured Tobacco per Acre

		Farm yard manure, 30 cart-loads per acre.	Farm yard manure, 20 cart-loads, and 600 lbs. castor cake per acre.
1905-06	...	2,298 lbs.	2,457 lbs.
1906-07	...	1,770 ,,	1,988 ,,
1907-08	...	1,102 ,,	1,671 ,,
1908-09	...	1,824 ,,	2,232 ,,
1910-11	...	2,146 ,,	2,328 ,,
Average	...	1,828 ,,	2,135 ,,

The extra cost at present prices would be only Rs. 10 per acre while the value of extra tobacco, *viz.*, 307 lbs., means an increased return of Rs. 50 to Rs. 60 per acre. However there is a very general impression among the Charotar tobacco growers that castor cake used as manure tends to lower the quality of the resulting tobacco. But this was not the case with tobacco grown at Nadiad with the above treatment, for it was reported that while tobacco manured with castor cake *alone* was inferior, the tobacco produced in the above treatment cured very well.

The above treatment has been more recently repeated in the Borsad taluka and again an equal increase in yield was obtained with no difference in quality.

In order to make certain that the suggested treatment did not lower quality the experiment was again conducted with a smaller dose of castor cake in addition to farm yard manure and applying it earlier, that is to say, a fortnight before transplanting, with the following result: –

Yield of Cured Tobacco per Acre

Year.		Farm yard manure, 20 cart-loads per acre.	Farm yard manure. 20 cart-loads, and 224 lbs. castor cake per acre.
1924-25	...	1,468 lbs.	1,452 lbs.
1925-26	...	1,572 ,,	1,872 ,,
1926-27	...	1,349 ,,	1,682 ,,
Average	...	1,463 ,,	1,669 ,,

Again the extra yield amounts to 206 lbs. per acre worth about Rs. 34 for an extra cost of Rs. 11 only. The quality was again reported by the local purchasers to be similar. This indicates that if a small dose of only about 224 lbs. of castor cake in addition to farm yard manure be applied, the profits are proportionately greater and it is clear that every cultivator can apply, with profit, at least 224 lbs. of castor cake to all of his tobacco fields with certainty of increased profit. This cake may be put on in the powdered form when applied before transplanting, or it can be applied by putting it in a water trough, using the soaked water for irrigation.

PRINTED AT THE YERAVDA PRISON PRESS, POONA.

Department of Agriculture, Bombay

LEAFLET No. 10 OF 1927

Tobacco as a Crop in the Dharwar District

The extension of the tobacco crop in suitable areas in the Bombay Presidency is eminently to be encouraged, as it is, at present, one of the two or three crops which give the largest money return when grown as a dry crop. At present its cultivation in the Deccan and Karnatak is almost entirely limited to a relatively limited area in the Belgaum and Satara Districts and in the Kolhapur and surrounding States.

The transition tract in the Dharwar District has now proved itself to be very suited to this cultivation, and the present leaflet is intended to show the method which has proved successful at the Government Farm near Dharwar. This part of the Karnatak typically belongs to the area known as the "transition tract" with an annual rainfall of about thirty inches, spread over eight months of the year. This rainfall is so distributed that there is an average of about five inches before the beginning of June (so-called "ante-monsoon" rain), about four inches in June, about fifteen inches from July to September, about five inches in October, and a few showers later than this.

With a fairly sure and well-distributed rainfall of this kind, and with a soil which is usually deep, lighter in texture towards the west and heavier and blacker towards the east, the transition tract is capable of producing a large variety of *kharif* and *rabi* crops, the main rotation being cotton and *jowar*. The tobacco crop, if grown, will probably largely replace cotton, though it requires a good deal more care and trouble. It may also serve as a third element in the usual rotation, which is recognized as wise by the better cultivators of the tract, and in so doing, would replace the present uncertain crop of potatoes in the *kharif* season followed by wheat, or *udid* (*Phasealus mungo*) in the *kharif* season followed by wheat. Farmers will find tobacco an excellent and more reliable substitute for either of these croppings.

But the main purpose which tobacco would serve would be to replace cotton, and the following figures show how the

actual crop reaped on the Dharwar Farm has compared in cost and profit with the *kumpta* cotton normally grown in the years 1924, 1925 and 1926:—

Kumpta Cotton Crop (Dharwar)

		Weight of seed cotton per acre	Value of seed cotton per acre	Cost of cultivation per acre	Net profit
		Lbs.	Rs.	Rs.	Rs.
1924-25	...	443	77	19	58
1925-26	...	603	79	15	64
1926-27	...	300	42	15	27
Average	...	449	66	16	50

Tobacco Crop (Dharwar)

		Weight of dry tobacco per acre	Value of tobacco per acre	Cost of production per acre	Net profit
		Lbs.	Rs.	Rs.	Rs.
1924-25	...	511 (Jarda)	93	62	31
1925-26	...	901 (Bundles)	182	64	118
1926-27	...	700 (Jarda)	148	78	70
Average	...	704	141	68	73

The net return from tobacco is higher than that from cotton, though the cost of production is also much higher. It leaves the land, however, in much better condition for the following crop.

In general it may be said that if tobacco is valued at Rs. 5 per maund, a little lower than the average of the last three years, it will compete with cotton if the latter brings a price below Rs. 250 per *nug* (1,344 lbs.) of seed cotton.

Methods of Cultivation on the Dharwar Farm

Raising Seedlings of Tobacco.—The site for the seed bed should be so selected that it should be protected from the strong sun in the afternoon. Protection from heavy showers is necessary, as the young seedlings are very small and are easily uprooted by heavy rains. The seed bed should be well raised above the ground and should be manured with well-rotten farm yard manure. The soil should be well pressed before sowing the seed as otherwise the small seed is distributed as the soil sinks at each watering. An ounce of seed over an area of one hundred square feet is enough for transplanting an acre. The seed beds should preferably be long rather than square. Instead of having a seed bed ten feet square it would be better to have one twenty feet long by five feet wide. It is easier to water a narrow bed and weeding and thinning become easier as a man can easily reach the centre of the bed with his hand while sitting on the border.

The seed should be sown in the first fortnight of June, after mixing it well with fine ashes. This gives bulk to the seed and ensures even sowing as the white colour of the ashes indicates the place where the seed has been sprinkled. A fine layer of ashes should again be sprinkled over the bed and the surface should be slightly pressed by a small light plank. The bed should then be watered by a fine spray. The watering should be done very slowly so that there should be no flow of water over the surface of the bed. The slightest flow will make the seed move and collect in the place where the water stands. The seed bed should be watered twice every day, morning and evening. The seed germinates after seven days. The seedlings should be thinned out after six weeks, leaving half an inch space between each plant. They are ready for transplanting by the end of August or beginning of September.

Cultivation of the Crcp on the Dharwar Farm.—The land reserved for tobacco should be ploughed six inches deep after the harvest of the previous crop of *jowar*. Well-rotten farm yard manure at the rate of five tons per acre is spread on the surface. It is very essential that the manure should be well-rotten. The land should be harrowed cross-wise three or four times after showers and the clods should be broken. The plank should be then worked a day or two before transplanting or even earlier if there are no prospects of rain, as the plank must be worked just after rain as soon as the upper layer of the soil is dry. This makes the soil firm and impedes the movements of wire-worms, the chief pest of tobacco. These beetle grubs move underground in the loose surface soil and eat the stems of transplanted seedlings about half an inch below the surface of the soil. The working of the plank hardens the surface soil and the movements of the grubs are considerably checked.

Transplanting should be done at the end of August or beginning of Septembcr. The seed bed should be well wateıed before the seedlings are upıooted for planting. If the seed is sown in time the seedlings generally have four good leaves and a pair of bottom leaves that are partly damaged or unhealthy. The bottom leaves should generally be removed and the seedlings well examined and all insects found on them destroyed. If the area to be planted is big, the seedlings should be uprooted and supplied in small lots as required. The planters should not hold the seedlings in their hands as they do *chilli* or *brinjal* seedlings, as the

tobacco seedlings are very delicate and the warmth of the hand for any length of time is sure to damage them. Each planter should, therefore, have a small forked twig of some leafy flexible tree. The bifurcated branches should be turned round and tied together. A handful of seedlings should then be placed on the pan made by the twisting of the forked branches, the cut twig serving the purpose of the handle.

Planting is done three feet apart both ways. The field is first marked by a drag locally called Yadak with three or four tines three feet apart. The drag is drawn crossways over the flat field as straight as possible and planting is done at points where the marks of the tines cross. This gives fairly straight planting and accurate spacing. A man first makes holes with a small pick or *kurpi*. Another man pours a small quantity of water in the holes after which the planters begin planting. The quantity of water used at the time of transplanting should only be just enough to make the soil surrounding the stem and the roots moist.

It must be remembered that tobacco planting is quite different from chilli planting. In the latter case two seedlings are pressed in the soil by the finger. Such a thing will be wholly destructive for tobacco seedlings. Tobacco stems are very tender and brittle and will either break or get bruised. The finger should, therefore, first be inserted in the soil and the seedlings should then be put in and the soil slightly pressed around, care being taken to see that no dry soil comes in contact with the stem. Unlike chillies only one seedling is planted in case of tobacco. Planting should preferably be done in the evening, to avoid exposure to the sun immediately after planting. For about a week after planting the plants droop in the evening and revive in the morning. The field must be carefully examined two or three times a week early in the morning.

The plants that remain drooping even in the morning should be examined. They are generally damaged by insects or in a few cases damaged while planting. Such plants should be replaced by fresh ones. This work continues more or less for a month though the number of dead plants goes on diminishing at each successive inspection. All beetle grubs, beetle or other insects found at the stem, should be picked up and destroyed. The wire-worm which is the most destructive insect is generally found at a distance of about an inch from the stem in the soil and should be carefully searched for.

The first interculturing should be given three weeks after planting and, in all, the crop should be hoed as many times as possible. After each hoeing the soil round the stem should be well stirred by *kurpi* and the leaf just near the ground should be removed. The plants should have clean stems to a height of about three inches from the soil after which the leaves should be allowed to grow. This makes hand working round the stem easy, and prevents the leaves from spreading on the ground, which damages their quality. By the middle of October the plants are ready for topping. Each plant should have nine to eleven good leaves after which the top should be pinched off. The pinching off the top is known as topping. All plants are not ready for topping at the same time as all plants are not of uniform growth and, therefore, the operation continues up to the middle of November. After topping, the plant produces side shoots at the exils of the leaves. These must be removed every week and the soil well stirred by the *kurpi*. These operations continue up to the end of January when the crop is ready for harvest. The growth of the side shoots is very vigorous in October and November when more attention is necessary. The leaves begin to turn yellow in January and the surface of leaves becomes wrinkled. Rusty eye-like spots develop afterwards. When all leaves show these symptoms they are mature and the crop is ready for harvest.

Harvesting.—The crop is cut by the end of January or early in February. Harvesting is usually done early in the morning as the leaves are not brittle at this time and do not tend to break. The plants are cut at the base with a sharp sickle. If the produce is to be turned into bundles, as will be usually the case, the collected plants are put into freshly dug pit in the ground about four feet deep and big enough to take the whole produce. *Jowar* straw (*kadbi*) is laid at the bottom of the pit, and after the cut plants are placed carefully in layers over this, a layer of *jowar* kadbi is put on the top and the whole covered with earth. The pit is then left for forty-eight hours, and then opened and the plants taken out and carted to a house for bundling.

The actual method of preparation for the market in the Southern Maratha Country is described in Bulletin No. 140 (Bombay Department of Agriculture, 1927). but usually it is possible to sell the pitted tobacco to professional curers who prepare it for the market.

Any further information can be obtained from the Superintendent, Government Farm, Dharwar.

PRINTED AT THE YERAVDA PRISON PRESS, POONA.

THE POONA

AGRICULTURAL COLLEGE MAGAZINE.

VOL. XIX.] FEBRUARY, 1928. [No. 4.

EDITORIAL NOTES.

'Thanks to contributors and subscribers.'

With this issue we come to the close of the Nineteenth year of our Magazine. We are gratified to note that this Magazine has been steadily growing in popularity as can be evinced from the increase in the number of subscribers in India and abroad. Its financial position is also satisfactory. We are conscious that all this is due to the deep interest taken by our contributors, and subscribers, and we offer them all our sincere thanks for their warm support and request them to continue it unabated for years to come.

* * * *

'Gleanings'

From next year we wish to open one more h ing in our Magazine at the end as "useful information or Gleaings" and to publish under it different kinds of useful information or News-bits. Many times it happens that we come across useful and interesting information or hints while reading Scientific books or periodicals, or interesting observations while working which cannot by themselves form sufficient material for an article and thus remain unpublished. We therefore hereby request all our contributors to send to us all such bits which they think as useful and interesting.

* * * *

Bill before the Council.

The most important topical subject that is discussed by the Vernacular press in this presidency is the bill regarding the *Fragmentation of land and its consolidation.* We had already referred to it in our last issue that the general public is not in favour of this bill. Not only that but from the trend of discussion carried on at present in papers it appears that the people have taken a different and an alarming view. Some papers have roundly charged Government that they have

not only not consulted the opinion of the people concerned but have not even consulted their experts in the Agricultural and co-operative departments, and that goes to streugthen their already formed conviction that in launching this bill Government have some sinister motive behind it. The far reaching effect of the bill will be the eviction of many a small farmer and utter ruin to cultivators who are already not prosperous owing to various disabilities. As a consequence a regular agitation is set up and propaganda carried on to oppose the bill tooth and nail and printed forms of a petition to Government to stop the bill are being broadcasted to all those who have got direct and indirect interest in land.

* * * *

The other side of the question.

There appears to be more of sentimentalism in all this agitation or why "sentimentalism seems to be the mode"; still it is no use ignoring the reasons and arguments put forward by the opposers of that bill, because they show the other side of the question. They say that 50 percent of the owners of land own holdings of 5 or less than 5 acres each. Such holdings form only 2½% of the whole land under cultivation. Holding of over 5 Acres and upto 25 acres are owned by about 38% of the land holders and this forms only 10% of the whole Area. Thus 12·5% or nearly 13% of the whole land is owned by about 88% of the owners of land. In other words 87 percent of the whole land under cultivation is owned by 13% percent of total land holders and consists of bigger holding than 25 acres. Is it intended by government by this bill to improve the condition of only 13% of land which conssits of small holdings? In doing so 87% of the small land holders are affected, so as was contemplated in 1917 the Government might have started the operation of the bill as an experimental measure in one district only and thus legislated for its general application after seeing the success or otherwise. The question no doubt is a very complicated one and must be before the Royal Commission on Agriculture which is busy writing up its report. The matter, they say, may be postponed till the recommendations are out.

DRY FARMING ALL OVER THE WORLD.

BY

N. V. KANITKAR M· Ag., B. Sc.

Soil Physicist to Govt. of Bombay.

(with the kind permission of Indian Broadcasting Company Ltd.)

1. The subject I have chosen for a short talk this evening is Dry-Farming all over the world. At the outset you would I am sure like me to say what is meant by Dry-Farming and how it is applicable to the whole world? Now, Dry-Farming is the system of Agriculture useful for countries with a low rain-fall. It is the production of crops *without irrigation*, on lands that receive less than about 20 inches of rain annually. It is the opposite of Irrigation farming of Humid-farming. It always implies farming with a small annual rain-fall.

2. It is well-known that nearly six-tenths of the land surface of the earth receives an annual rain-fall of less than 20 inches and can be reclaimed for agricultural purposes only either by irrigation or by dry farming. Dr. Widstoe who is a great authority on Dry-farming, computes that only one-tenth of, this vast area at the most can be brought under irrigation by a perfected world system of irrigation, leaving thus half the land surface of the earth to be reclaimed, if at all, by the methods of Dryfarming. Such dry or arid tracts are found not confined to any one part of our Globe but are practically in every continent. In the United States of America more than 50 per cent of the continental area receives less than 20" inches of rain. In Australia nearly two-thirds of the area receives less than 20 inches of rain. Other continents like Asia and Africa contain similarly vast areas with such low rainfalls. Even in India, we know that there are extensive tracts in the North like Sind, Rajputana, and the Punjab, which receive less than 20 inches of rain annually. In the South, again, vast areas forming the Bombay Deccan and the Karnatak together with the Nizam's dominions receive less than 20 inches of rain annually. Dry-Farming therefore is a problem that affects the whole world and we in India are directly interested in it.

3. We are likely to believe that Dry-farming is altogether a new method of agriculture. As a matter of fact it is an ancient practice. The great nations of antiquity lived and prospered in arid and semi-arid countries. In more or less rain tracts of Egypt, Palestine, China and India, the greatest cities and highly civilised people flourished in ancient days. No doubt these nations constructed great irrigation systems which after all could irrigate only limited areas but for bringing the vast areas under cultivation they had to depend mainly on Dry-Farming, though the methods followed and the implements used were of a primitive type. The adoption of this system on a large scale with the help of improved implements in the countries of the new world is comparatively of recent date. Before the middle of the nineteenth century extensive tracts in America, Canada and Australia were lying as desert wastes. No one thought of settling and farming in these regions as the rainfall was less than 20 inches, and irrigation facilities were not possible. But in that year of gold discovery i. e. 1849 some adventurous pioneers settled along the Pacific and started farming under those arid conditions. The brilliant reseraches of Hilgard and Campell greatly influenced and helped these pioneer farmers to achieve success. The extensive deserts which were only waste have all been conquered by man and are converted into fertile fields capable of sustaining a large and flourshing population, within less than half a century. Such is the interesting and encouraging history of dry-farming.

4. I now propose to expalin very briefly the principle underlying the system of dry-farming and then mention the salient features of the methods practised in dry-farming. Every one knows that no plant can live and grow unless it has at its disposal a sufficient amount of water, which it takes up only from this soil by means of its roots. The water thus taken rises through the stem and reaches the leaves whence it evaporates into the air. There is thus a constant stream of water passing through the plant from roots to leaves. The quantity of water thus taken by plants from the soil has been determined by various workers. It has been found that 500 to 700 pounds of water are required for the production of one pound of dry plant matter in the arid regions. Water is then limiting factor in crop production and hence the greater the amount of water that can be made available the greater will be the quantity of crop produced. And in the system of dry farming the water that falls in the form of rain or snow is the only possible source of water.

5. Now it must be remembered that all the water that falls upon the soil cannot be wholly available to the plant. Some water of necessity will evaporate directly into the air from soil surface, and some will be permanently held by the soil particles. But the dry-farmer must avoid loss of water in other ways such as; run-off from the surface (which causes a double loss by the removal of fine particles of soil along with the water) or loss by free drainage. The chief aim of a dry-farmer must be the conservation of the soil moisture for the use by crops.

6. Now the first step in the starting of dry-farming is the selection of suitable land, for, it must be recognised that all lands are not suited for dry-farming. In most of the countries like the U. S. A., Australia, and South Africa where dry-farming is carried on with success, the selection of land is not such a vital factor for in most of these countries the lands consist of alluvial fertile plains of silt deposits 8 to 10 feet deep. Besides on account of their good physical properties they form the ideal lands for dry-farming. But in India especially in the Bombay Presidency, special care must be taken in the selection of land. The soil should be deep and clayey. The depth ensures the storage capacity and then clayey nature gives retentiveness for water. The land should be level as far as possible. This level character prevents the loss of rain water by surface run-off.

7. After proper selection of land the next step consists in carrying on a series of operations which will in the first place increase the storage capacity for water, secondly will ensure complete absorption of rain water by preventing surface run-off and lastly will conserve the whole of this moisture or water until required by the crop. Thorough cultivation of land consisting of deep ploughing soon after the first crop is removed, followed by the disk harrow and then the blade harrow several times will achieve these objects. Erection of small bunds all round the field over small areas will present the surface run-off and ensure the absorption of the whole of the rain-water even during heavy downpours of rain. The ploughing increases the pore space and storage capacity for water. But the conservation of water in the soil is secured by the formation of a covering of a dry loose layer of soil by repeated harrowings. This dust-blanket, as it is called does not allow the heat of the Sun to penetrate to the lower layers of the soil, and thus prevents the evaporation of water from the soil into the air. It also prevents the cracking of the soil which otherwise

causes great loss of water by evaporation from the whole depth of the soil.

8. After the preparatory tillage, the next point is the choice of the crop and the sowing at the proper seed-rate and at the proper time. In the Western countries several crops are successfully grown by the methods of dry-farming. Wheat, maize or corn, oats, barley, peas and even potatoes are considered suitable. Here in India we have no experience with all these crops. The Bombay Department of Agriculture have carried on experiments at their dry farm at Manjri for the last three or four years with two important grain crops of the Presidency viz ; Bajri and Jowar, with very great success. A very low seed rate is the essential point to be remembered in sowing the dry crops. The distance between rows should be such as will allow of the use of interculturing implements quite easily. These are to be used every 10 or 12 days to keep up the soil mulch or dust-blanket. This is best accomplished by implements known as Planet Junior Hoes, worked by hand. A man can do easily one acre a day. None of the operations mentioned involve any extra out-of pocket expenditure to the rayats.

9. As already mentioned, dry-farm experiments have been carried on at Manjri by the Soil Physicist to the Government of Bombay for the last 3 or 4 years. The rainfall during the three years was 25″, 14″ and 20″ respectively. A very good crop of Jowar was secured in the year with 25″ of rain. Nearly 1000 Lbs of Jowar grain per acre was obtained. This is twice the normal out-turn in this part of India. But what is really more important is that even in a bad year with 14″ of rain when the surrounding cultivaton completely failed to get any crop at all, we were able to get normal crops of Bajri and Jowar. In the year of moderate rain of 20″ we were able to obtain again 1000 Lbs of Jowar per acre and a still larger quantity of Bajri.

10. The results so far obtained not only in the Western Countries but even those obtained here in the Bombay Presidency though only for three years, are really very encouraging and indicate a great possibility for dry-farming. More scientific work in the laboratory and in the field will have to be done to enable us to lay down on a sound basis the method and practice of Dry-farming in the Bombay Deccan. At present several districts such as Ahmednagar, Sholapur and Bijapur are liable to periodic famines and scarcities due mainly to the uncertainty or precarious nature

of rain. The cultivators in these districts are required to tide over the difficulty either by resorting to borrowing or by migrating to places of industries, to earn their living for the time being. This indebtedness or periodic migration results in the lowering of the standard of agriculture, which in turn lowers the crop-yields. The low crop-yields result in lowering the efficiency of the cultivators and the vicious circle thus continues, having no end.

11. With the introduction of the practice of Dry Farming, it is hoped that these evil effects of famines and scarcities will be very largely mitigated if not entirely prevented. If our educated classes begin to take an active interest either in their own lands or in the lands of the uneducated and ignorant cultivators in the villages, the agricultural industry which is the premier industry of India, will receive the necessary impetus and help, and the peasantry will be made prosperous and happy.

LOCUSTS AS AGRICULTURAL PESTS.

BY

T. N. JHAVERI, Esq. L. Ag.

Assistant Professor of Entomology Agricultural College, Poona.
(with the kind permission of Indian Broadcasting Company Ltd.)

To night, I wish to talk to my unseen audience about visitations of Locusts in India and more especially about the North-west Locust, which had made its re-appearance, during the past one or two yaars in Sind, Kathiawar, Gujarat, Punjab, and other Northern parts of India, and, is still reported in Sind doing a lot of damage to cultivated crops, trees and other vegetation.

The Bombay Government is seriously considering what practical measures can be adopted against this pest and experiments are being made in Thar and Parkar Districts with a scouting system

designed to obtain information about the movements of Locusts in the breeding areas with a view to launching a compaign against them. For these purposes a sum of Rs. 10,000 has been placed at the disposal of the Commissioner in Sind.

Speaking generally, I would like to tell my audience, that India is the home of two kinds of Locusts or more precisely, the ground of periodical invasions of two kinds of Locusts which are very destructive to crops, and are well known to the people of the tracts through which they pass. These two kinds of Locusts have different habits and life history, hence different methods of control are required to be adopted to check them.

Before I enter into details of any of these, a question which first arises, is this:—"What is a Locust"? A Locust is a grasshopper belonging to the family of insects, called "Acridiidæ" of the order "Orthoptera". It multiplies rapidly, forms swarms and migrates on the wing, over great distances alighting here and there to feed during the journey. The two principal types of Locusts in India are, (1) the North-west or migratory Locust called scientifically "Schistocerca peregrinum", & (2) the Bombay Locust called "Cyrtacanthacris succincta".

As for the North-west Locust, it mostly restricts itself to the upper part of India, while the Bombay Locust remains in the southern of the Peninsula, from Bombay southwards. However from Ahmedabad southwards, through Gujarat, Central India. Central Provinces, Bengal, and Assam either Locust may occur.

The range of the North-west Locust is very far and wide. It extends from Algeria, through Northern Africa into Cyprus, Arabia, Persia, through Baluchistan into Sind, Kathiawar Rajputana and the Punjab. From the last four areas it migrates in vast swarms over Northern India, into the Western Himalayas, into the United Provinces, Behar, Bengal and Assam and occasionally Calcutta is also visited forming its southern-most limit.

As far as the present information goes the life history of the North-west Locust in India, is briefly this:—Permanent breeding grounds exist in the sand hills of Western Rajputana and in the Suliman Range, and similar tracts.

Egg-laying takes place, about March and April in the North-west Punjab, and again if conditions are suitable about August, while in Western Rajputana egg-laying generally takes place in

June and July and again if conditions happen to be favourable in October.

Each female lays about 80 to 100 eggs, of the size of small grains of husked rice. These are laid an inch, or more deep into loose sandy soil, in a mass joined together by some gummy matter. One characteristic feature about egg-laying, is that, many Locusts lay their eggs within a very small area. So within an area of a few acres even a maund of eggs, equal to 40 lakhs of eggs, may be collected.

The eggs hatch out after about three weeks and the young hoppers that come out from the soil are green in colour which entirely change to black, within a few hours. Afterwards the black colour changes to pinkish yellow, as the hoppers grow bigger in size. While in the hopper-stage this insect moves over the ground in concentrated masses like a large army, devastating field after field that come in the path.

Within a period of 6 to 8 weeks the hoppers acquire full wings, form swarms, and migrate over great distances.

At this time the colour of flying swarms is salmon pink.

In this way they go on moving for a period of three months or so and before mating and egg-laying the colour of the swarm changes to vivid yellow. At this stage the movement of the swarm is slow, damage to crops is also negligible and the insects are more or less torpid.

Thus the whole life cycle is finished within a period of six months, and, in India this Locust breeds twice a year in its dry natural home.

Such is the habit and life history of the North-west Locusts which do so much harm to green vegetation in the hopper as well as in the winged stage. A swarm of Locusts may extend over several miles, and is sometimes so dense as to hide the sun from sight. Even thick branches of trees break down on account of their weight, when they settle on them. Roads and even railway lines are found covered over with thick layers of these insects and at times the train is impeded till the rails are cleared. The crops such as Bajri, Juwari, Wheat, Til, Gram, Cotton and grass etc. suffer most, but any kind of field or orchard crop in the track is attacked. They also attack the foliage of various trees with great avidity such as Sirus, Pipal and various acacias etc.

Last year their ravages were so severe that they devastated crops from over an area of about 82,000 acres in Sind alone, while in Kathiawar and Gujarat they laid waste an area of about 15,000 acres.

Such are the periodic ravages and in-roads of this Locust which appears all of a sudden, sometimes after an interval of 10 or 12 years, and remains in the tract devastating crops for two to three seasons and then disappears or dies out.

Such is the state of things regarding the North-west Locust in India.

As for control this requires concerted action, and it is the duty of all to combine and cooperate on a large scale. There are instances on record of such successful control being carried out in this Presidency, as well as in Northern India, jointly by people and State to mitigate the evil.

These measures can be shortly summarised as follows:—We now know from the life history and habits of this Locust, that the egg masses are laid in sandy soil very close together, so from a few acres of land, wherever the Locusts halted and deposited eggs, a large number can be dug out and destroyed or ploughed deeper into soil to prevent their hatching.

It is also known that old yellow coloured winged Locusts are ripe for egg-laying and less harmful to crops, so a careful watch of the movement of such swarms should be kept and wherever the eggs are laid, these should be destroyed as said before.

Secondly the young hoppers that hatch out from eggs, remain together for sometime in a congregated mass, and thereafter they pack into columns and march together over the ground, so these can be very easily destroyed by various mechanical devices. Such as (1) by beating, trampling or crushing, (2) by sweeping into big bags, (3) by driving the marching columns into dry long trenches (2 ft. wide & 2 ft. in depth) and burying them with earth, (4) by driving them into the nearest hedges or dry brushwood and grass and igniting these. I have had personal experience of successful work on these lines against Locusts.

In this way whole swarms of wingless Locusts can be wiped out and destroyed. For dealing with the swarms of winged Locusts which are of red colour, and are very dangerous to crops

wherever they halt, the people should assemble in the fields with tomtoms, kerosine tins, brass dishes etc. and should make a loud noise by beating these as well as by shouting and bawling. On doing this the flying swarms will get frightened and will invariably change their direction.

However if the swarms settle in young standing crops these might be collected by sweeping a grass hopper bag over the crop.

This is a fairly simple job and little or no injury is done to the crops.

Lastly I would like to touch on the natural enemies of Locusts. These are numerous. Amongst these there are several birds such as Jowari-bird-called Rosy Pastor Starling, crows, kites, wagtails, storks, sparrows and several others which prey upon hoppers, and winged Locusts and devour them voraciously. Frogs, Toads, Lizards, Squirrels and monkeys are also said to feed on Locusts.

In addition there are certain flies which parasitize both the egg masses and the adult Locusts. Flying Locusts are also found to be parasitized by small red mites, which cause them to become sickly and lethargic.

There are also some beetles and ants which feed upon and destroy the eggs and nymphs of Locusts.

In Egypt and South Africa, a certain fungoid disease called "Coccobacillus acridiorum" occasionally destroys large numbers of Locusts. Trials have been made to introduce this disease, on Locusts in India, but the attempts were not crowned with success.

Thus I have tried to-night to put before you in as short and lucid a form as possible the available information on North-west Locust regarding its life history, habits, natural enemies and various means of control. I trust my remarks may prove of some interest to the people of sind, where the Locusts have appeared and are damaging the crops in several districts.

FIXATION OF SAND DUNES.

BY

Mr. JAIKRISHNA INDRAJI

(*Received for publication from Prof. G. B. Patwardhan. Ag. Economic Botanist Poona, with the permission of Maharaja Kumar Saheb of Mandvi.*)

(1) Circumstances attending the fixation of Dunes:—Various sorts of plants, creepers and grasses grow on the Dunes situated on the sea coast near Cutch Mandvi. If these are allowed their natural growth, without any uprooting or injury, consequent upon human trampling or cattle grazing, the surface of the Dunes will be gradually covered up with these wild growths, which will prevent the prevailing winds from dislodging the sand, and thus checking any tendency to further movements.

When I came to Cutch in A. D. 1923, I was ordered by His Highness the Maharaj Kumar Shree, to find out ways and means to check the sand from the adjoining Dunes migrating towards the new palace under construction. This was the commencement of my observation and researches into varieties of trees and plants that could be usefully employed in achieving this end.

Within a short time, I found that the sand could be fixed up by means of the plants etc. that grow naturally on the Dunes, with a slight help from some imported varieties.

(2) At the outset, I had to contend with two main obstacles as under :—

(1) The Dunes were found to be open for any Tom Dick or Harry to tramp about, and the cattle enjoyed a free licence to graze about the whole area. Some of the tender plants were bodily uprooted, the more sturdy ones being cut off from above the ground to be used as fuel.

(2) The next trouble was with regard to certain fields with sandy soils on the west between the palace and the Dunes. Crops used to be raised in these fields only during the monsoon, when Phaseolus aconitifilius was

sown after surface ploughing. The crops were removed soon after the rains, leaving the fields entirely bare, with soil loose. From these fields sand used to be blown about towards the palace, causing great trouble to the work people employed, and forming miniature Dunes on the west, one such having already been formed about a hundred feet away from the palace.

(3) Under the circumstances, I arrived at the natural conclusion, that as long as the Dunes were allowed to be treated as public property, and the fields allowed to be grown haphazard, there would be no possibility of stemming the tide of the inrushing sand. Consequently to meet these contingencies the following preliminary steps were taken :—

(1) Under orders of His Highness, the Dunes were declared a Reserved Area trespassing being strictly prohibited, and a watchman was engaged to see that the orders were carried out rigourously.

(2) The fields were acquired by the State after paying liberal compensation, and were ordered to be amalgamated with the Dune Reserve Area. Attempts were also to be made to grow some sand-fixing plants etc. in this area.

(4) When the above orders were carried out, it was found that many creepers etc. had come out naturally over the Dune area after the first rains were over and also that some of the old plants that were cut off but not uprooted, had also begun to sprout. Due to these growths the Dunes were spread over with a green covering, and the sand-blowing had ceased. My first year's observations gave rise to the hopes that, although the sand-blowing-along the sea coast could not be checked immediately. the Dunes could be trained by allowing and encouraging the natural vegetations to grow, and by planting suitable trees etc., which would help to cover up the loose sand, and thus gradually to finally fix up the Dunes.

(5) Relying on the experience I had gained at Porbunder, I planted Casuarina equisetifelia, Phœnise sylvestris, Cocos nucifer a Thespesia populena, Melia Azadirachta and Pongamia glabra. But the results gained were not what I had at Porbunder. The reasons were that the porbunder Dunes are not so high, nor the sand so loose; hence the results there with Casuarina equisetifolia and Cocos nucifera were successful.

Therefore, planting of these trees in the Kutch Dunes was postponed and attention was directed towards the proper preservation of the trees etc. that were already growing, and augmentation of the same by new seeds. In order to prevent the sand from blowing towards the palace from the fields referred to above, rows of trees were planted to form a shelter belt. The arrangement of the trees was as under.

(1) Ficus bengalensis, each 40, feet apart, with Pandanus Odoratissimus in the center.

(2) Euphorbia Tirucalli, planted as a hedge on west of no. 1.

(3) Phœnixe sylvestris on west of no 2.

(4) Cocos nucifera on east of no 1.

All the fields on the West of this belt were strictly closed against any trespass.

By this means, after the first rains, these fields were covered with such growths as Indigofera cordifolia, Crotalaria medicaginea and Solanum minimum. Some plants of Cynodon dactylon were also to be seen. These growths were allowed to thrive unhindered or uninjured and thus within a year, the whole area was spread over with this verdure Indigofera cordifolia being more prominent and the sand-blowing was reduced to nearly half of what it was before. On the eastern boundary of these fields where miniature dunes were formed the following plants had grown :—

Indigofera cordifolia; Sericostoma pauciflorum, Panicum antidotale and Eragrostis cynosuroides.

A year after that Cynodon dactylon, Crotalaria medicaginea, and Solanum minimum grew in abundance along with Indigofera cordifolia. Among these plants Crotalaria medicaginea, being used as food for camels during monsoon, was removed and utilised for that purpose. The Solanum minimum was also removed from the very roots. Thus only Cynodon dactylon was allowed to develop, and the fields were full of these only, with a sprinkling of Indigofera cordifolia and Tephrosia tenuis. At present, if any person were to look from the palace towards the west, he would find that, not only is a whole area overspread with a green sheet of verdant vegetation, covering the bare sand, but also that the sand that was flying and blowing so terribly even in mild weather, was a thing of the past now, in the hottest summer. All the fields on the west near the shelter belt, are now profusely covered with Cynodon dactylon, and

the ridges of the dunes with Sericostoma pauciflorum and Panicum antidotale: Shelter belt trees also help a good deal in minimising the force of the wind. Regarding the vegetation that had grown already and was attacked by cattle, I give the following list:

(1) Cordia Rothii. (2) Melia Azadirachta. (3) Crotalaria Burhia. (4) Ipomœa biloba. (5) Sericostoma pauciflorum. (6) Panicum antidotale. (7) Zizyphus jujuba. (8) Indigofera paucifolia. (9) Calotropis procera. (10) Withania somnifera. (11) Vitex negundo. (12) Grewia populifolia. (13) Prosopis spicigera. (14) Ærua monsonia. (15) Asparagus dumosus. (16) Phœnix sylvestris. (17) Scœvola Kænigii (18) Lotus Garcini. (19) Citrullus colocynthis. (20) Indigofera tinctoria. (21) Tephrosia purpurea. (22) Bergia odorata.

As to the species of plants introduced by me here, the following may be mentioned:

(1) Canavallia obtusifolia. (2) Aloe vera. (3) Agave rigida (4) Cassia auriculata. (5) Pongamia glabra. (6) Casuarina equisetifolia. (7) Phœnix sylvestris. (8) Pandanus odorata. (9) Bassia latifolia. (10) Thespesia populnea. (11) Melia Azadirachta. (12) Ficus glomerata. (13) Imperata arundinacea. (14) Sapindus emarginatus. (15) Euphorbiā Tirucalli. (16) Albizzia Lebbek. (17) Engenia Jambolana. (18) Dalbergia latifolia. (19) Ficus bengalensis (20) Ficus religiosa. (21) Bombax malabaricum. (22) Leucœna glauca. (23) Bauhinia racemosa. (24) Tamarix gallica. (25) Helianthus abutilifolia. (26) Calophyllnm inophyllum. (27) Mimusops hexandra. (28) Salvadora persica. (29) Cryptostegia grandiflora.

(6) Below are enumerated the names of grasses that were already growing and others introduced by me.

(1) Cyperus scariosus (2) Cyperus rotundus (3) Panicum antidotale (4) Setaria verticillata (5) Cenchrus biflorus (6) Imperata arundinacea (7) Saccharum spontaneum (8) Andropogon laniger (9) Sporobolus indicus (10) Cynodon dactylon (11) Chloris barbata (12) Eleusine flagellifera (13) Eragrostis cynosuroides (14) Halopyrum mucronatum.

(7) The above grasses were already growing there. The following are those introduced by me (1) Phragmites Karka. (2) Psamma Arenaria.

The following plants do not object to extra saltiness.

(1) Fimbristylis minima (2) Halopyrum mucronatum (3) Panicum antidotale (4) Scævola Kæniji (5) Lotus Garcini (6) Spermacoce

hispida (7) Heliotropium indicum (8) Aspargus dumosus (9) Imperata arundinacea (10) Sporobolus indicus (11) Eragrostis cynnsuroides (12) Tamarin gallica (13) Bergia odorata (14) Corchorus antiohours (15) Fagonia arabica (16) Sesbania aculeta (17) Volutarella divaricata (18) Launæa pinnatifida (19) Phoenin sylvestris (20) Salvadora persica (21) Leptadenia Jacquemontiana (22) Leptadenia reticulata (23) Sueda maritima (24) Chenopodium (25) Atriplex Stocksii (26) Sueda nudiflora (27) Polygonum elegans (28) Cressa cretica.

(8) I give below short notes as to which place is more suitable to what plants from those mentioned above, and what steps are taken to augment their growth.

Generally the area of the Dunes is divided into four parts for convenience as under :

(1) The area from near the Sea shore to the toe of the Dune (2) The Dunes proper, sprung out of the depositing of the shifting sand. (3) The low lying portion, i. e., the valley, between the Dunes (4) The area beyond the Dunes.

In (1) Halopyrum mucronatum will grow near the shore, and form a stem. This stem will throw out various branches, which will spread from 15 to 50 feet. These branches will, in their turn, give out minor branches, which will take root at each knot, and thus the process will be continued. In some places between these branches, Cyperus capillaris, Panicum antidotale, Ipomæa biloba, Scœvola Kœnigii, Lotus Garcini and Citrullus Colocynthis etc. are growing. Halopyrum mucronatum, Ipomœa biloba and Citrullus Colocynthis etc. will also be seen at places, and this interspersing and intertwining will go on. This is a very useful phenomenon, which will help to cover the whole area with these vegetations, amongst which some minor shrubs also may grow.

In (2) anything except Ipomœa biloba will hardly be found, yet the following plants etc. will be particularly useful for the purpose of fixing up the shifting and blowing sand :

(1) Crotalaria Burhia (2) Lotus Garcini (3) Crotalaria medicaginea (4) Indigofera paucifolia (5) Indigofera tinctoria (6) Tephrosia tenuis and its other varieties (7) Teramnus labialis (8) Canavallia obtusifolia, (9) Spermacoce hispida (10) Calotropis procera (11) Periploca aphylla (12) Leptadenia Jaquemontii (13) Cordia Rothii (14) Heliotropium indicum (15) Trichodesma indicum (16) Sericostoma

panciflorum (17) Ipomœa biloba (18) Convolvulus microphyllus (19) Withania somnifera (20) Vitex Negundo (21) Ærua monsonia (22) Aerua Javanica (23) Pupalia lappacea (24) Asparagus dumosus (25) Leucas cephalotes (26) Grewia populifolia (27) Triumfetta rotundifolia (28) Panicum antidotale (29) Cenchrus biflorus (30) Saccharum Sara (31) Ephedra peduncularis (32) Gymnosporia montana, and (33) Prosopis spicigera. In these plants, Nos. 1, 12, 13, 16, and Melia Azadirachta are found to be very suitable. They not only prevent the sand from dislodging, but also hold up the moving sand in their branches, carry the roots deeper, the branches rising above the littoral Dunes caused by the arrested sand which Dunes are also gradually covered up in their turn.

Seeds sown by any method including broad-cast on the ridge or slope of a Dune with loose or shifting sand, will not grow, as they will be bodily swept away by the moving sand and burried under it. If perchance some seeds do escape this catastrophe, they may sprout during the monsoon, only to wither and die later on for want of nourishment from the loose and dry sand below. Meeting with this difficulty here, the area was divided into plots, 3 to 4 ft. sq. by planting cross rows of Aloe Vera. The seeds of any plant etc. that might have grown around, will be blown into and arrested in these plots. In order to prevent these plots meeting with the same fate, and being buried, dried leaves or vegetable refuse are put in them. The sand depositing in the plots will slip down below, and during rains, this refuse will rot forming very nice humus. Ipomæa biloba, Canavalia obtucifolia, and Cassia auriculata, if sown in seeds after one monsoon will be protected and also will take root. The last named, if cared for well for one year, will take firm roots. The result of this process of planting has been that the seeds sprout on the Dunes, which will be thus protected and the sand prevented from blowing about. Ours is yet a beginning, and as the study of the Dunes and the Dune-plants progresses, more information will be available. But one fact is established that the Dune-plants etc. are in themselves capable of fixing up the flying sand.

From my meagre experience of three years in these dunes, I can say that the plants of the following Natural Orders may grow not only on stationary sands, but also on moving sand, if well protected and supported against the strong S. W. Wind and well cared for with occasional watering till well established:

(1) Guttiferæ (2) Malvaceæ (3) Sterculiaceæ (4) Meliaceæ (5) Celastrineæ (6) Rhamneæ (7) Sapindaceæ (8) Leguminosæ (9) Myrtaceæ (10) Lythraceæ (11) Cucurbitaceæ (12) Compositæ (13) Goodenoviæ (14) Sapotaceæ (15) Salvadoraceæ (16) Apocynaceæ (17) Asclepiadaceæ (18) Boraginaceæ (19) Convolvulaceæ (20) Solanaceæ (21) Verbenaceæ (22) Amarantaceæ (23) Euphorbiaceæ (24) Gnetaceæ (25) Lilaceæ (26) Palmeæ (27) Cyperaceæ (28) Gramineæ.

Now coming to the third division of the area, i. e. the valley between the Dunes, during heavy rains, water sometimes collects in the valley, to be dried up soon after, and the water running down slopes emerges on the other side. Indigofera paucifolia will generally grow in the valley, and Sericostoma pauciflorum and Panicum antidotale on the slopes. Due to this the valley and the slopes are covered up, fixing the loose sand in this area. As examples of this the valley between the Tamachi dune and the Limda dune, and also between the Dry Dune and the Khajuri dune,may be cited. These valleys and slopes are so beautifully covered up with these plants that not a single particle of sand can blow from there.

Coming to the 4th and the last division this area consists of the plains on N. W. and S. E. of the palace, the N. W. part being of non saline soil and sweet water, while S. E. part being of saline soil and saline water. Both these parts are formed by the depositing of the blowing sands from adjoining dunes.

In the non-saline soils, Cynodon dactylon and some other plants grow naturally. Some garden trees and crops also are raised. The only thing to be done here is to plant large trees, to guard against strong winds.

In saline soils, no good trees or crops can be raised, except Eragrostis cynosuroides, but even this fails in very saline soils. Yet nature helps in improving this soil and protecting it from being washed away, by growing *Sporobolus indicus* or First Usar-grass or Rhe-grass. These grasses spread over the dry land, and collect and cover up the dust and loose sand, themselves coming out above this sand. After some time, Eragrostis cynosuroides, Sueda maritima, Cynodon dactylon etc. make their appearance, improving the soil gradually.

Certainly now is the time for observing the beauties of these Dunes, as they are naturally adorned with green natural growths.

|| The Dunes or trees will teach ||
|| That which masters teach not. ||

(T. THOMPSON.)

A NEW VEGETABLE PRODUCT FOR JAM AND JELLY.

'*Roselle*' (Hibiscus sabdariffa).

BY

V. H. KULKARNI B. Ag. & G. B. DESHMUKH B. Ag.

(*Horticultural Section, Agricultural College, Poona*).

The necessity of preserved, canned or dehydrated products for human consumption is keenly felt, when one goes on worldround trips either for exploration or for research in the dense-forests of the Tropics or in the vast and extensive deserts like Sahara.

Out of many fruits and other plant-parts used for the purpose, Hibiscus sabdariffa (लाल अंबाडी) presents an unique plant-product in its agreeably acid and charmingly red coloured calyx lobes, which can most profitably be used in the manufacture of Jams and Jellies. On this account, it commends itself for cultivation on a large scale on the Horticultural grounds.

History of the plant :—Roselle is a native of the old world and India. How was it introduced in Europe in 1576 is not understood; however, it is known for certain that it found its way into the Botanic Gardens of England in 1596 from Jamaica. The culinary uses of the plant's calyces were recognised early in the 18th century in the West Indies. The uses of the leaves of the plant were long known to Javanese, as early as 1658. In India it is being grown along with H. cannabims chiefly for its fibre, sold as Bimbipatan jute, and the leaves and young tender shoots as vegetable. Roselle has long been cultivated in Mexico, in parts of Central America and West Indies. It had been reported as an Horticultural crop in Australia and in 1898 two factories were reported as working and exporting Jam to Europe.

Cultivation Notes :—Roselle is generally grown from seed. Seeds germinate readily even in 30 hours from the time of putting them into the soil. But much depends on the vitality of the seed, which does not keep long in hot and moist climate. Again, seeds do not germinate readily if the same is collected before full and complete development of the fruit—a consequence of the stripping off of the calyces before the capsule is mature. The seeds may be

sown in situ or in seed beds and then transplanted in the permanent place. Roselle grows in any soil, which drains readily and does not hold much water. In moist places it suffers much from the attacks of Nematodes and the Eelworm. Again, the hot and moist atmospheric conditions of the place induce the plant to throw out more leafy growth and thus to abort completely the flowering. Too much leaf-mould or farm yard manure also does the same harm. To correct this, it is but necessary to check the growth and hasten flowering. The seed or seedling is put in the soil at 4 × 4 ft. or even at 5 × 5 ft. No care except that of weeding and watering during hot spells only is wanted. It is to the benefit of the plants to give one pruning to the seedlings when about 6–9 inches high as it tends to form a bushy shrub with many branches. The young prunings are conveniently used as vegetable.

The bush flowers within 3 months from the date of sowing the seeds and the calyces are ready for picking up within 4 months. The plant gives 3–4 pickings. Afterwards it is barren or the pickings are less remunerative. A note of warning should be struck here that the calyx lobes must not be picked before the capsule is ripe and completely developed lest the seeds collected can not be sound. One plant yields from 2 to 4 lbs. of fruits.

Preserves:—Roselle jam or jelly is well appreciated by those who know it and compares very favourably with other jams and jellies available in the market.

In making Jam the sepals alone are used, while in the preparation of Jelly the whole seed bag is strained off.

Jam-making:—Strip off the calyces and boil them in an allumi·nium or an enamelled pot with water just to cover them, till they are soft to the touch. When boiling is commenced, add sugar at the rate of ¾ lb. to 1 lb. of calyces. Boil the material for about 10 to 15 minutes, skimming in the mean while the scum that forms on the top. The end point is reached when the temperature goes to 218°F. Bottle the jam in glass jars after sterilizing them properly and capping tightly.

Jelly-making:—Boil the fruit with the seed bag as above till it is tender to touch. The whole is then put in a cloth and juice extracted. Boil the pulp second time with a small quantity of water and mix the strained juice with the first extraction. The mixed juice is further boiled with the addition of sugar in the proportion of 1:1 (1 cup of juice to 1 cup of sugar, measure by measure).

Jellying point is reached when the juice reaches the temperature of 104°C. Bottle the jelly in sterilized glass jars and store in a cool dry place.

From 1 lb. of fruit about 1¾ lbs. of jelly of good consistency can be prepared.

The calyces may also be dried in air or sun and the dried stuff used for jam or jelly making whenever required. The only precaution to be taken is to soak the dried stuff in cold water for about 2/3 hours before the first process of boiling the fruit is begun.

The fruit might also be used in colouring jellies—Guava jelly, for instance—and similar products where a bright red colour is desired.

From the above it can be observed that the Roselle is a very valuable plant and hence an initiation into the manufacture of such attractive, tasteful and at the same time cheap preserve from the fruit will be very much appreciated.

CULTIVATION OF SUGARCANE IN KUTCH.

BY

H. G. MEHTA, B. Ag.

Sugarcane is grown round about Bhuj, the Capital of Kutch State and also in Ananjar and Mandvi Talukas. Other talukas have got negligible area under Sugarcane cultivation.

Soil :—Generally the soil is sandy loam and a little superior or inferior to sandyloam. This is a very poor soil specially for sugarcane crop. The following analytical figures will show the poorness of the soil :—

Stones	...	17·24 %
Sand	...	93·02 %.

Note :—Sand is calculated on fine matter. Perhaps due to this quality of soil that the cultivators grow sugarcane on a very small scale, and that also at an interval of ten to twelve years, rather a long period for rotation.

Preparatory tillage :—After Diwalee that is November to January, whenever convenient, the plowing is given with a wooden Kutchi plow three to four times to secure a good tilth. The harrowing is done only once. After that the beds of 4′×5′ or 4′×4′ or 4′×6′ are prepared by hands and not by plow. While preparing beds care is taken to look to perfect level and to remove the clods etc. if any. Then farm-yard manure to gether with town sweepings–occasionally is spread in the beds by ordinary method. The manure is not mixed with the plowed soil.

Planting :—Generally February is the month for planting operations. The whole sugarcane is cut into small pieces having three eyebuds in each set. Nearly twenty or twenty-five such sets are required for one bed. The distance between two sets is one foot and there are four rows approximately in one bed. This leads to 12000 to 15000 sets per acre.

The sets are thurst in the soil slightly slanting, keeping the apex of the bud on the top, that is while thursting or inserting in the soil the cushion portion of the bud will enter in the soil first and then the apex. The belief is that while inserting in the soil the protuberance of the rind at the nodes protects, the bud from mechanical injury. After insertion of the sets the first irrigation is given immediately. The buds begin to sprent in six to eight days and complete germination is in twelve days.

Manure and manuring :—Concentrated manure is not used at all. A few people may be using oil cakes or fish now-a-days. Farmyard manure or Pen manure together with town sweeping and ash is used. This bulky manure is supplied to the crop in three doses.

First—before planting as noted above.
Second—just after one month.
Third—when the crop is six months old.

The quantity supplied per bed is one basketful that is roughly one maund (20 lbs). There are six hundred beds per acre so 12000 lbs. per acre is used per dose. Thus in three doses it comes to 36000 lbs. or equal to (30 baskets=1 cart) 20 cart loads.

Irrigation :—There is a main water channel and this is supplemented by small ones in each bed. The irrigation is given on alternate days or at the interval of two to three days. The irrigation cost is the chief item of expense. The water for irrigation is drawn from a well of about fifty feet deep by mhot. The mhot in use is Sundhia. सुंढिया.

After-Culture :—Earthing up of the sugarcane is not practised and hence lodging is not uncommon even when the crop is only eight to nine months old. Suitable inter-culture is given. The implement used is known as सातेडु Satedu.

Harvesting :—Gul is rarely prepared. Generally whole canes are sold in markets for chewing purposes. Raw canes when eight months old are cut. The height of the cane is 10 to 12 feet.

Outturn :—As gul is not prepared the weight figure is not available. Hundred to hundred and fifty canes are found per bed. This leads us to the figure 60000 to 90000 per acre.

Variety :—Pundya type and Deccan red type of canes are common. Rarely we find cane of the type Karnatic red or Barbadoes or Java type. There are no special names given. The colour is the main difference.

Diseases and Damage :—Jackals, pigs do damage to this crop. In Diseases. Ratadio, that is Red Rot, Bhedo, that is stem-borer and Dhot that is withering of the leaves and drying up of the sugarcanes similar to Kevado.

Cost of Cultivation :—

Operation etc.	Units				Koris.
Plowing	4	0	0	8	24
Harrowing	1	0	0	2	2
Bed preparing	9	0	0	0	9
Interculture	2	0	0	4	6
Weeding	0	30	0	0	15
Spreading manure	1	0	1	2	9
Planting Sets	2	0	0	0	2
Irrigation continuous counting for five months at 4 K. per irrigation.					600
Cost of sets at 1 K. eight canes of 1000 canes					125
†Cost of manure 60 carts. at 4 K. a cart.					240
Miscellaneous.					3
Total					1035

Income after deducting state Revenue, carting to Bazar and such other expenses. 1500

†*Note*—The Residual manure is used for the rotation crop.

Note—Rs. 100 equal to Koris 379.

THE BEST UTILIZATION OF SURPLUS FRUIT.

BY

V. H. KULKARNI. B. Ag.

(*Horticultural section, Agricultural College, Poona*)

The acreage under fruit crops in the Bombay Presidency during these 12 years has immensely increased and in some cases like Grapes and Citrus, has more than doubled. It is rapidly increasing still and is sure to increase as the well-known paying Garden crops, such as, sugarcane etc. can not now bring as much substantial return as the fruit crops do. The result of this rapid increase will be that a large quantity of surplus fruit, which the increased production is sure to bring in, will in most cases be disposed of at a very cheap rate or be wasted if found not to cover the cost of marketing. In places, which are situated far away from big markets or are unsuitable for transport, the question of disposing of the crop itself-then what of the surplus fruit-becomes a serious problem to the grower. The problem becomes much more serious in the case of readily perishable fruit crops, such as Fig, Guava and Jambul.

How can such fruits be utilized to advantage? The only promising outlet for such fruits is their marketing in the form of preserved products.

There are many kinds of preserves that can be prepared from fruits but out of them, the best and the most appreciable and at the same time easy to prepare is the 'jelly.'

In the preparation of any fruit jelly, the presence of three important constituents is found essential. These are pectin, acid and sugar. Out of these, pectin is the most important; in fact, it is the fundamental jelly making substance. If a fruit is found deficient in any of these constituents, jelly can not be prepared unless the lacking substance is supplied in a suitable proportion.

Pectin is found in greater quantity in fruit peel and in most cases has to be liberated by boiling. It goes into collidal solution with water and can easily be precipitated by alcohol. It is this substance which makes the syrup to 'jell.' Fruits deficient in acid or pectin or both can very well be blended with those containing an abundance of these constituents. It is abundant when

fruit is just in a ripe condition and is converted into pectic acid and metheyl alcohol when it passes that stage.

To extract juice, fruit should be boiled with a small quantity of water in an alluminium vessel for about 15 minutes to make it tender and to extract most of its pectin and juice. (Juicy fruits like Orange and Grapes need no addition of water). Overcooking the fruit some times results in imparting a dull colour to jelly. The hot juice with pulp should be allowed to cool and then transferred to a jelly-bag to make the extract bright and clear. Instead of throwing away the pulp, it should be boiled second time with a very small quantity of water and the pressed juice mixed with the first extraction.

The quantity of sugar to be added to the juice depends upon the quantity of pectin, the fruit juice contains. In order to determine the amount of pectin qualitatively a simple method is employed: add to a small quantity of juice an equal amount of 95 % alcohol to make the pectin precipitate. Large quantity of pectin in the juice is determined by the precipitate appearing in one mass or clot, a few pieces of gelatonous material will indicate its moderate quantity in the juice and a flaky precipitate shows the presence of a poor pectin therein. If the juice is found rich in pectin, an equal quantity of sugar, measure by measure, should be added, ¾ its measure if found moderalely rich in pectin and half its measure if found fairly rich. Juice poor in pectin must be blended with other juice rich in that substance or be concentrated by boiling till it gives a satisfactory pectin test.

It has already been stated that juices of fruits, low in acid such as Fig and Guava, require the extra addition of acid to get jelly of good consistency. The acidity of such fruit juices can be increased by the addition of Citric or Tartaric acids or by the addition of a juice of high acidity. Lemon juice being cheap and available everywhere is preferable to all. Jellies of good consistency have been obtained from fruit juices, with acid contents varying from ·5 to 1·5 %. But the exact percentage of acid that is required to be present in fruit juice for getting maximum amount of jelly of good consistency will vary with particular fruit.

After the addition of acid, juice should be kept on the stove or fire and when it is boiling, sugar should be added. Boiling should be as brisk as possible, as long boiling results in loss of flavour and darkening of colour of the resulting jelly. Frequent skimming

4

should be done if found necessary. Boiling should be continued till the temperature of the juice reaches 104° C. When the jelly falls in wide sheets from the stirring spoon. Overcooking the juice makes jelly sticky and sirupy. The jelly should be allowed to stand for a few minutes in the vessel to get all scum on the surface and after removing it should be poured hot in hot sterilized jars. Removing of the scum makes the jelly uniformly coloured and quite transparent.

If the jelly is to stand any length of time before using, it should be sealed air-tight. The simplest way of doing this is to pour a thin layer of hot paraffin over the surface of the cooled jelly or to cover the same with a paper dipped in brandy or alcohol. This kills all germs that may have fallen on the surface of the jelly and this insures its keeping.

THE PHUKA OPERATION PRACTISED UPON COWS AND ITS EVIL EFFECTS.

The Act for the prevention of Cruelty to Animals Act No. XI of 1890 enacts the following :—

If any performs upon any cow the operation called Phuka, he shall be punished with fine which may extend to one hundred rupees or with imprisonment which may extend to three months or with both.

The Act has been declared in force since 21st March 1890 in almost all parts of British India But nothing has been on record as to what this operation is like, how it is practised, what are evil effects on the health of the animal and why it is that the operation is condemned by law. I was myself asked many a times by officers of the Police Department and candidates appearing for examination in law as to what this operation was like and I could

not until a few years ago answer to the question. I said to myself it is a shame that I as a Veterinarian should not know anything about it. I took the question in hand at once and started on a regular programme of visits round Gawalia's stables and to my surprise I found the operation quite common, practised by gawalias and cultivators on cows every where I visited for the purpose. Uptil now I have seen myself this operation being practised on nearly 60 animals. I closely marked the effects and saw as to why it is performed and how it is practised on cows and I am now glad that I have been able te keep before the profession my views on the operation. If you ask the gawalia about it, he will surely reply that it is quite common and that it is not cruelty to practise the operation and that there are no bad effects on the health of the cow after the operation. It is with this view therefore that I am writing this article for the information of the general public and those concerned with live stock and I am sure they will agree once they see the operation and its evil effects that the practice is most hedious, most abnoxious, most injurious and cruel and that it brings about sterility in cows. It should be at once stopped and persons carrying on such operations should be brought before the court as per law provided and fined heavily.

The operation is performed on cows in the following manner :-

In Northern India and parts of India where people speak Urdu the gawalias there catch hold of the lips of the vulva in such a way as to enable the operator to blow right into the vagina up to the mouth of the uterus good lot of air in holding the lips tightly together to prevent air getting out. The word Phuka means blowing and hence it is that the operation has been named after. I think the operation must have been well known in those parts hundreds and hundreds of years ago.

In some parts the tuft of the tail is introduced right into the vagina upto the mouth of the uterus.

In some parts a pledget of straw big enough and well besmeared with some irritant oil is introduced right into the vagina up to the mouth of the uterus to be lodged there for some time.

In some parts a pledget of cotton wool soaked in irritant oil is directly introduced into the mouth of the uterus.

The oil used in the most of the cases is mustard oil which is irritant when it is prepared fresh and not boiled. This operation

is performed on cows that are very trouble-some to drop the milk. By introducing air, the tuft of the tail and pledgets with oil irritant in nature the result is the counterproduction of sympathy which compels the cow to drop the milk. On such cows the operation is not performed only once but every day until she gets into easy way of dropping milk. The evil effects of the operation are therefore most distinct namely it produces continuous irritation of the genital organs and as a result of the irritation septic poison is the result. The most common form is septic Leucorrhoea with an offensive mucopurulent discharge which can be easily smelt as soon as you enter a stable where such operation is daily performed on cows. As you go ahead inspecting the cows those are subject to the operation will be noticed to stand with their back arched and the tail lifted, their genitals swollen and discharging offensive and the tuft of the tail matted and the hairs half eaten away with the tip of the tail gangrenous and rotten and sometimes ulcerated. If you were to examine the internal of the genitals namely vagina and the mouth of the uterus you will find the lining membrane of the vagina and the mouth of the uterus badly ulcerated and inflamed. And lastly if you were to go into the history of such cows a year or so afterwards you will surely find that they remain sterile, very difficult to breed by any means. Now then is it not a serious thing to note from a point of animal economy ? Looking to the number of animals undergoing such an operation every year the loss the country suffered and I am sure this must be one of the important causes of such animals ultimately falling into the hands of the butchers every year. If you consider very carefully the last named evil namely sterility in cows I think it is a very serious problem to deal with and I only hope that persons concerned with live stock, with law, with the veterinary profession and Agriculture in general will certainly see their way to stop this evil practice as early as possible.

Now looking to the purpose for which a gawalia practises this evil operation upon cows very troublesome to drop milk, I should think it is not the fault of the cow, but it is the fault of the breeder. The three principles of breeding are selection, environment and heredity, and I think if we were to follow these factors in practice there is no necessity to practise this evil upon poor dumb creatures for the sake of milk only.

* A GRAPE VINE DISEASE NEW TO INDIA. "DEMATOPHORA NECATRIX HARTIG."

BY

SOHRAB R. GANDHI, M. Ag.

I was working in a vineyard near Nasik during 1926–27, and in certain parts of the property many of the plants showed sudden drooping of the young shoots and leaves, with no other visible symptoms of disease. On exposure of the roots of these plants, a white fluffy fungus was observed growing thickly on them as well as on the root collar,–while a similar appearance was seen on the roots of some apparently healthy but weak plants in the neighbourhood. The presence of the fungus on the roots was betrayed by the existence of whitish loose bark at the base of the trunk. The fungus was indentified at Pusa as Dematophora necatrix Hartig, a very widespread agent in destroying vines, fruit trees, potatoes, beans, sugar beat, oak, pines and spruces in Europe. It has not been hitherto recorded in India.

The Imperial Mycologist, who indentified the fungus, states that experience elsewhere indicates that the mycelium of the fungus in question travels underground and when it comes in contact with the rootlets of a plant it kills them, and gradually works its way into the tissues of the larger branches of the root. In the case of large plants, the mycelium, after travelling along the root up the base of the trunk, bursts through the cortex in the form of a snowy white, fluffy mass, which spreads along the ground till it comes in contact with another root.

Immediately after the discovery of the disease, the diseased roots for three feet round the base of the trunk, were exposed to the sun and the drooping young growths were cut down to the riper and healthier portions of the canes. The whole fungus was removed from the roots by scrubbing them with coir, and they were then

*Paper read at the Fifteenth Annual Meeting of the Indian Science Congress Calcutta, 1928.

washed with Bordeaux mixture and allowed to dry. After this a thin coat of tar was applied to the diseased roots, and they were covered. To this treatment the diseased vines responded wonderfully. They soon put out healthy growth and yielded a normal crop, but later observations indicate that this was only a temporary relief.

European experience indicates that the best treatment is to remove and burn the affected stock and thorouhgly to stir, aerate and dry the adjacent soil. Spraying is of course, out of the question and the cure of roots already affected seems impossible. The soil should be well drained, as the fungus thrives best in sodden soil. The Imperial Mycologist advised the isolation of affected plants by a trench, and removal of the plants themselves and all their roots, and also of all weeds near the affected plants. He also suggested the exposing of the base of the trunk as far down as possible and the powdering of the trunk and surrounding soil with sulphur.

The following notes indicate what has been further observed with regard to this disease at the Godrej Fruit Farm, Nasik. Most of the affected grape vines formed new adventitious roots at the base of the trunk, which gradually become a part of the regular root system. The lower diseased roots gradually rot, and the place is taken by these newly formed roots. A diseased plant could be temporarily revived by pruning the shoots to healthier portions, cutting away altogether its main root system beneath the collar, and earthing up the adventitious root system. Such renovated plants remain dwarf, and bear little or no fruit. All parts of the root are liable to be attacked, from the smallest rootlet to the thickest root. In early stages, the mycelium is visible in white streaks on the roots and these streaks may or may not be continuous. A root may be healthy in one part and diseased in another. In extreme cases the white mycelum concentrates on the thick roots near the base of the trunk, loosens the bark,and eventually bursts out near the base of the trunk above the soil surface. The disease has so far not been detected on vines younger than three years old in the orchard, but signs were found on cuttings a year old in the nursery. The disease is most easily detected when the vines are fruiting, for the bunches remain undersized and the berries refuse to swell. In a badly infected area the most outstanding feature was the uneven ripening of the bunches of grapes and also of the berries in the bunch. Diseased or drooping plants could be temporarily saved from death by pruning the end portions of the drooping canes only,

A light pruning of the drooping canes is quite enough to start new growth. Painting with tar and dusting with powdered sulphur had a beneficial effect on the diseased roots exposed near the trunk as observed five months after the treatment was applied. It proved a temporary benefit, however, and the plants once more showed signs of the disease. Fresh new roots given out from the base of the trunk of such a treated plant showed infection.

From the observations up to date, it would seem possible to check the disease by proper soil sanitation, that is to say by regular stirring of the soil at every irrigation and by artificial drainage in badly drained clay soils.

SUGARCANE BREEDING

BY

V. V. GADGIL, B. Ag.

Divisional Superintendent of Agriculture, Deccan Canals.

:o:

In the Bombay Presidency breeding of cane is always done by propagation of sets and all the work of finding out suitable varieties at the Manjri Farm is only done by this method. A large number of varieties are brought to this Farm from several cane growing centres and their suitability is tested by propagating the same by means of sets. But really speaking this is the secondary method of breeding as the real method of evolving a new strain consists in cross-breeding of two desirable varieties so that we may get a combination of all the desirable qualities. In India this kind of work is only done at Coimbtore under the guidance of the Imperial Sugarcane Specialist and it is a matter of great pride for the Department that it has supplied most profitable strains to U. P., Punjab, Behar, Assam, and Burma and all these Provinces are now reaping the benefit of these strains. The Annual expenditure of the Coimbtore Sugarcane

Breeding Station is about Rs. 50,000 while the extra profit derived by the above provinces from co-strains is as under :—

Punjab	3 Lac Rupees.
United Provinces	7 " "
Behar and Assam	4 " "
Other Provinces	½ " "
Total :—	14½ Lac Rupees.

In Assam the position of the Indigo planters was very critical when the Analine dyes were reintroduced after the Great War and if the cane cultivation had not given them a helping hand they would have suffered huge losses. The Coimbtore Station has also supplied better strains of cane to West Indies and Cuba Islands where they are highly appreciated and Rao Bahadur T. S. Venkatraman deserves special credit for the same.

But all these strains belong to thin canes and will not be of much use for Bombay Presidency where we have got one of the best thick canes in Pundia. The yield of the local Pundia is also very heavy and very few varieties can compete with the same in Bombay Presidency.

An idea therefore came in my mind why the Coimbtore Station should not supply a better strain of cane for the Bombay Deccan. Instead of wasting time in correspondence it was thought desirable to visit the Coimbtore Research Station during the Christmas and get the first hand information in this matter.

Before explaining the method of crossing I will first mention the climatic condition of this place so that the reader will get the idea of why this place was selected for cane breeding. The height of Coimbtore is about 1200 feet from sea-level and the maximum and minimum temperature is 104° and 60° F. The total rainfall of the year is only 25 inches but it is fairly well distributed throughout the whole year. The months of July to October receive heavy rains but in every month at least ½ to 1 inch of rain is recorded. The land is made up of granite rocks and is not very fertile. I may even say that the soil of the Research Station is very poor, and they have to put a layer of silt from outside to make the land suitable for cane-cultivation. Recently a separate station has been opened for the breeding of thick canes and a second breeder is also added to the staff. The terms thin and thick cane are only relative to the habit of plants and not simply refer to the girth of the stems. Some of the apparently thick canes are classed under thin varie-

ties as their characters fall in the category of thin canes. Similarly the same case holds good with some of the apparently thin varieties.

At Coimbtore almost all the promising cane varieties from the world are brought for testing and the characters are carefully studied. They are then classified into thin and thick varieties and sent to the respective breeding stations. From these varieties only those which produce arrows or ear heads are separated and are taken for cross fertilisation. Among them are found several kinds which only produce barren stigmas and anthers and they are unfit for breeding. In some varieties only the anthers are useful while the stigmas are sterile. In others only stigmas are useful while the anthers are not important. Such plants are useful for male and female parents of the new cross. In some varieties stigmas and anthers are both active but the stigma opens earlier and can be crossed with a pollen of different varieties. All the characters of each variety are studied first and then the crossing is attempted.

At Coimbtore planting is done in the month of January and the plants are ready for cross fertilisation in the month of October. Crosses are either done in the field or in a special protected place where the female plants are specially brought a fortnight before opening of the flowers. The female plants are selected from the beginning and a layer of earth is rapped round the stem quite close to the surface. In a couple of months new roots are formed in this mud and the plant can be cut below the lump of earth and taken to the breeding centre. This process is exactly like the gooty layering of Chikoos in the Thana District. When the plants are taken to the breeding place, they can be planted in the ground and can be kept in that place until the seed-formation is over. When the stigmas are ripe for crossing, some pollen of the known variety is shed over them and the seed is allowed to form in the usual way.

Crossing in Sugarcane presents peculiar difficulties owing to the extreme delicacy of the floral structure and hence no attempt to emasculate the flowers is made. In certain varieties male sterility is absolute and such varieties are selected for crossing. No bagging is attempted as it produces adverse influence in the seed setting and hence crossing is frequently done by merely marking the mother arrows in the field and keeping them constantly dusted with some known pollen till the stigmas are found to wither.

The parentage becomes more uncertain when the mother arrows possess fertile pollen of its own as the progeny may either be (1)

Selfed (2) a cross with a known pollen, or (3) a cross with some unknown parent by the agency of wind, insects etc. When the crossing is done in the field, sometimes the ripe inflorescence of some known variety is kept above the female flowers in a Jar of water so that the pollen may be dropped over the stigama in its natural course.

When the crossing is done in a specially prepared breeding place, the plants are often protected from rain by an umbrella made of palm leaves.

When the seeds are ready they are properly labeled and sown in earthen pots for germination. The bed is composed of Sand and Horse-dung and the seeds are evenly spread over the same. Constant sprinkling of water is made on these beds with a hose and when they are about 4 inches high, they are transplanted into other beds prepared on the land. The percentage of germination of the seed varies from 50 to 75 and a large number of seeds is generally obtained from one cross. The ability of the breeder is really tested when he compares the characters of one seedling with the other as he has to reject a large number of undesirable seedlings. The seedlings are constantly transplanted from one bed to the other and every time the weak seedlings are rejected. This process continues throughout the whole year and in the next year the plant becomes sufficiently big to produce sets to be tried in the field. The whole of the 2nd year is generally spent in studying the character of these plants and in the selection of healthy strains for a trial on a field scale. In the third year these strains are again planted in the field and final selection is made with special reference to th following points :—

(1) Tonnage of cane.
(2) Sugar contents.
(3) Early maturing.
(4) Resistance to mosaic and other diseases.
(5) Resistance to Borers.
(6) Resistance to Frost.
(7) Ease (case) of harvesting
(8) Resistance to drought.
(9) Behaviour during the 1st 6 months of growth.
(10) Fiber contents.
(11) Tillers.
(12) Deep or shallw roots.
(13) Resistance to lodging. etc. etc.

The success of breeding mainly depends upon the effective control of the flowering of cane varieties and a careful selection of suitable mothers. The use of rogues as parent is also one of the means of high percentage of success. In each crop of thick cane seedlings, there is always a small percentage of plants entirely different from their parents. These are very vigorous, flower very readily and produce abundant pollen which are therefore freely used for crossing. These plants are called rogues.

The reader would have now got the idea of how laborious and difficult is the task of obtaining the desirable strains from the cross fertilization of canes and what an amount of energy and patience is required to go through all the processes of breeding. At present about 3 Lac of seedlings of the thin canes are under investigation at Coimbtore while the thick cane breeding station which was started only last year has got 75000 seedlings under trial. It is therefore no wonder if the Sugarcane Breeder requests the cultivators of the Deccan to wait for 4 years more for getting any strain suitable for this tract.

One more difficulty which the Coimbtore breeder is required to face is the effect of climatic condition of the new tract to his newly evolved s'rains and in my opinion this matter is of utmost importance. To go out of this difficulty it is always better to start the breeding of cane in the very tract where the strains are required provided the climatic conditions are favourable to the work.

The selection of Coimbtore as a site for cane breeding station for Northern India is specially made, because the sugarcane rarely flowers in North India and even if it does it does not generally set seeds. The same statement appears to hold good for the Bombay Presidency also but as the climatic conditions and sea level of the Poona District are similar to those of Coimbtore, it is not known why the canes should not form seed at Poona or Manjri. Besides the writer was under the impression that at Coimbtore, the variety of Pundia is made to produce flowers by some artificial means but on personal enquiry, he did not find any work of that kind at Coimbtore. At Coimbtore they always depend upon the variety of which the male is sterile and take the chances in its progeny and I do not know why similar work should not be done at Poona or Manjri where an important work of the varietal trial of canes is conducted.

The work of Breeding cane is not one of the very complicated questions except climatic conditions favourable for flowering of

canes, and wherever such conditions exist in any Province the work need be undertaken by the Provincial Government. The Bombay Govt. had contemplated to start a Breeding Station for sugarcane and as the question is of a very great importance the work should be undertaken which would be of great help to cultivators. In the Bombay Presidency good deal of breeding on Cotton has been done, and it would not go difficult for them to start this at a suitable place with the experience of the Imperial Workers in this line.

While discussing the advantages of thin varieties in U. P. and Punjab an idea was constantly troubling my mind as to why we should not introduce these varieties on the Nira Right Bank Canal which is to be developed immediately. If the cultivation of thick varieties like the Pundia requires large capital and is not sufficiently remunerative in the present fallen prices of Gur, why we should not go in, for thin varieties which require less manure and capital. I leave this matter entirely for the consideration of the higher authorities.

I was not much impressed with the stand of several cane varieties that are grown at Coimbtore but among the lot of thick canes I would like a trial to be given to the following in the Bombay Presidency :—

(1) B. 6308.
(2) B. 6386.
(3) B. S. F. 12 (17).
(4) D. 74.
(5) H. 109.
(6) E. K. 2–very promising ones.
(7) E. K. 28.
(8) Java 247.
(9) P. O. J. 100, 2314 and 2725.
(10) Mauritius 33 and 1237.
(11) Figi. B.–very promising.

My visit to Coimbtore was very hurried and I had to make the best use of my time in seeing the cane, rice and cotton breeding stations but I must express my sincere thanks to Mr. N. L. Dutt. M. Sc. the Second Sugarcane Breeder who supplied me very valuable information about the research work carried on at Coimbtore.

ANT BURROWS IN GRASS AREAS.

BY

S. R. GODBOLE B.Ag., B.Sc., and R. B. DESHPANDE B.Ag.,

If one chances to take a stroll in grass lands with his eyes open, from November onwards he will come across spots where heaps of seed coats are located. Careful observation of these spots reveals the existence of nests of ants. Nearly a hundred of such burrows were examined by the writers at Kalas, Bhamburda Forest area and Padmavati. These nests were carefully dug out and the contents examined.

These burrows are generally found in places that are clear either due to heavy grazing or accidental fires. Wherever these nests occurred, the writers observed a quantity of seed coats, empty glumes of grass seeds, awns of grasses heaped to form a bed 3 inches thick and occupying an area of 2 to 3 sq.ft. In addition to the above, excreta of ants, remnants of dead insects, moults of wire worms were also found.

On an average, the area of a burrow was found to be one to two sq.ft. and the depth four to nine inches. There were one or more holes on the surface of the nest. These probably were the entrances into the nests. These entrances were connected inside by gallery like passages leading into roomy cavities. (Diagrams I and II. Plate I.)

The following were the contents of these burrows.

a. Black ants.
b. Seeds and other refuse.
c. Wire worms.
d. Other insects.

a. *Black ants.* (Holcomyrmex scabriceps). Diffeent stages of this species were found in these burrows viz. adults with wings, adults without wings and pupæ. On digging the nests, the exposed pupæ were observed to be picked up by ants and removed to the galleries of the nests. These pupae were found in small cavities (in the nests) which were lined with a certain whitish material, the exact nature of which is not known. Probably this lining serves as a cementing material and makes the cavities waterproof.

b. *Seeds and other refuse.* A large amount of seeds of grasses and other plants along with other refuse was found in the nests. In the majority of the cases, the seeds were unhusked and in the grasses the glumes and awns were removed. Each species was stored

separately in separate cavities. In rare cases only, the seeds were found to be mixed e,g, *Andropogon contortus L.* and *Aristida funiculata Trin.* The storing of these seeds was extraordinarily clean and neat. The number of species and the quantity of the seeds varied with the vegetation and its density near about the burrows and also the size of the nest. From a few seeds to a handful was found in these burrows. The seeds of the following species have been collected by the writers—

Andropogon contortus L.
Aristida funiculata Trin.
Indigofera linifolia Retz.
Zornia diphylla Pers.
Andropogon purpuro-sericeus Hochst.

The other refuse observed in these nests were

a. husks of seeds.
b. empty glumes of grasses.
c. excreta of ants.
d. moults of wire worms.

c. *Wire worms* These are the larvae of the Elaterids. These were of a brownish colour, shiny and smooth to the touch. Their length varied from 1 to 1¼ in. and thickness from one-tenth to one-fifth of an inch.

d. *Other insects.* Whitish grubs belonging to the group Camptosomes of the Chrysomelid family were found in one nest. Prof. Jhaveri informed the writers that these grubs were often found in ant's nests and that they fed on vegetable refuse in the nests.

The ants have a most systematic way of collecting the seeds. As a rule clean places are chosen as there will be no obstruction to carrying the seeds from one place to another. The seeds nearest the nest are first collected and then the seeds from the distant parts in all directions are looked to. Lines of ants nearly 30 feet long were seen actually collecting and bringing the seeds to the nests. When the ants reach the place of collection they scatter themselves to pick out the seeds from the crevices in the soil.

The ants are busy collecting seeds almost every day but they are most active after a shower. Quite a large number of these ants are seen on these days. This is probably because the soil is softer and easier to work.

The presence of the ant burrows is easily recognised by the thicker vegetation with better species (Plate II). It is obvious that burrows of these nature will greatly improve the vegetation in grass lands though the process will be very slow.

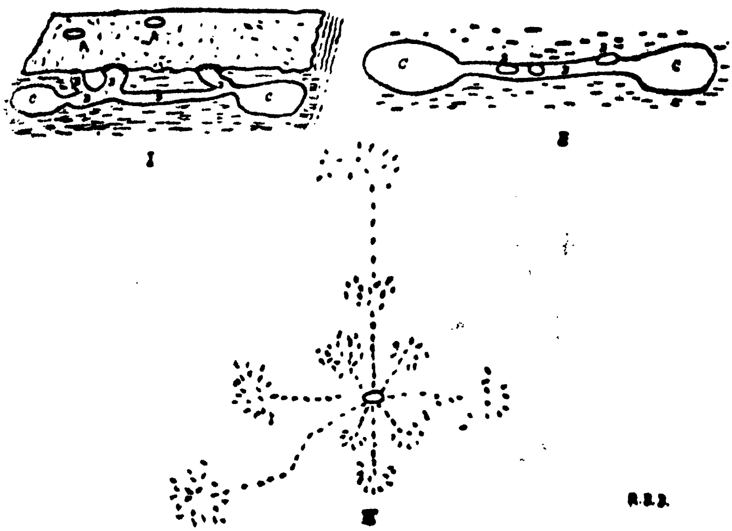


Plate 1

I. Surface and longitudinal view of ant's nest showing entrance holes (A), galleries (B) and cavities (C).

II. Bird's-eye view of ant's nest cut open through the cavities (C) and galleries (B).

III. Diagram showing the way the ants bring seeds to the nests.

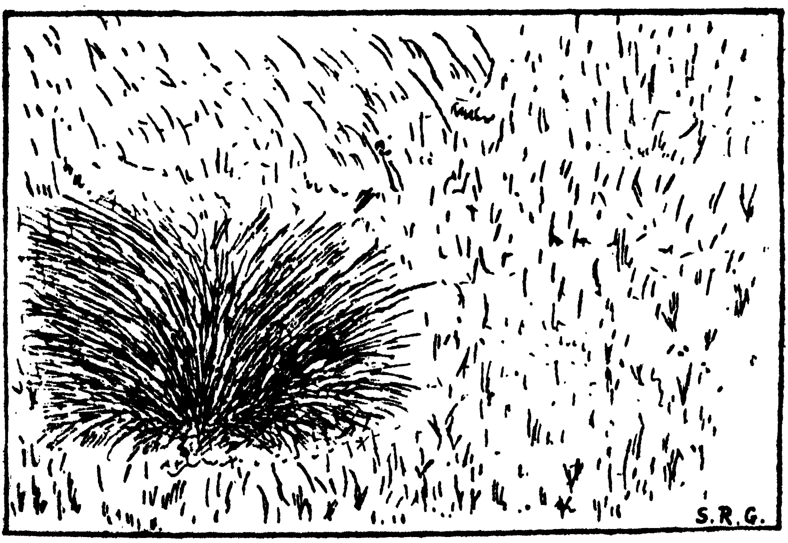


Plate 2

Diagram showing thick vegetation over an ant burrow.

A NOTE ON GRADING AND SELECTION OF JOWAR SEED.

BY

D. H. TAGARE Esq.,

Inspector of Agriculture, Sholapur.

AND

C. R. GOKHALE, Esq., B. Ag.

District Agricultural Overser, Barsi.

Importance of good seed for the cultivated crops, specially dry, is sufficiently known to the cultivators and efforts are always made to obtain and preserve good seed.

Up to the present there are in vogue two methods of obtaining good seed.

(1) Selection of heads.

(2) Selection of heads and testing for germination.

The first method aims at selecting healthy, bigger ear-heads on the threshing yard or better from the standing crop prior to harvest. The ear-heads are then stored as such or threshed and stored with the glooms etc., till they are required for sowing the next season, when the grain is cleaned and used.

In the second, every selected ear-head is tested for germination of the grain on it. A few grains from the lower middle and top portions of the ear-head are taken from each and made to germinate under suitable conditions of heat and moisture. In this method only those ear-heads which give 80 to 100 percent germination are taken for sowing purposes. This method is followed in Foreign Countries.

Seed of good quality should produce an even crop. But with all efforts at obtaining such an ideal seed even under the most favourable circumstances as to soil, moisture, heat etc, the resulting crops vary very much and generally the following defects are observable. These defects result in a 30 to 50 % loss of crop per acre according to the quality (good or bad) of the seed used.

(1) Loss due to blanks in the crop...10–38. %

(2) Loss due to inferior stalks which do not bear (ear-heads) 20–30. %

and

(3) Loss due to medium stalks which produce small ear-heads ....20–30. %

Thus even in a so called good crop 30–50 percent ear-heads are really good.

Jowar ear-head:—The Jowar ear-head is roughly a conglomeration of grains in different stages of development having been matured after fertilization at different times in season. Thus grain differs in size according to the time it was allowed to develop and dry. However good a ear-head may appear externally it has got underdeveloped, undeveloped and fully developed grain. Grain to be useful as seed should have a vigorous embryo and sufficient reserve food material to nourish it till it establishes itself in the ground with the help of the root and shoots. This being the state of grain on the Jowar ear-head, all attempts at obtaining ideal seed have been frustrated so far.

Grading of Seed.

The un-developed and the under-developed seed is smaller in size than the fully developed seed. This seed although possessing good germination fails to produce even crop. The young seedlings wither away and there are several blanks in the fields. Thus in order to eliminate the defect the seed should be separated according to their size.

Sieve for Grading.

Varietal and seasonal differences tell much on the size of the jowar grain and so the sieve that could be used separating one kind of grain, one year may not necessarily be serviceable the next year and so the best way is to find out a suitable sieve by trial. The sieve selected should be able to eliminate out all grain except the fully developed (which is about 75 %). However a set of two sieves with holes 6 and 7 to an inch has been found to suffice generally.

Sieves made of perforated tin 12″ X 18″ with deodar wood frame costs about annas twelve. One set would be serviceable for a number of years and for a number of cultivators too. The amount spent in purchasing these would be more than repaid even in a single season as will be vivid from the enhanced outturns.

In the Bombay Presidency the area under Jowar is 75,00,000 acres annually. If the cultivators select and grade their seed as has been pointed above the cultivators would be benefited by 75,00,000

of rupees for every average season even by counting enhanced net profit per acre by rupee one only.

This method of grading preceded by proper field selection could be beneficially followed in securing good seed of Bajri, Gram, Tur, Wheat etc ; etc ;.

Every kind of seed has to wait for some time at least before it is used for sowing. During this period an amount of seed is attacked by insects when not properly preserved. Seed attacked by insects has its embryo damaged and so fails to germinate and will produce blanks. So after cleaning and grading all seed should be once dipped in ordinary water. The insect-eaten seed will float on the surface of water and should be separated from the good seed below. The good seed below should be taken out and spread on the ground for a few minutes for drying before taking it out for sowing.

The following results are obtained from experiments conducted on the Government Farm at Mohol in the Sholapur District during the year 1926–1927 :—

Kind of seed used.	Number of plants per acre.	Outturn per acre.	
		Grain	Fodder.
(1) Seed of Selected ear-heads	20120 20780	665 lbs. 5 8 lbs.	1000 lbs. 852 lbs.
Total ...	40900	1253 lbs.	1852 lbs.
Average	20450	626½ lbs.	926 lbs.
(2) Seed of selected ear-heads tested for germination power.	21828 17860	875 lbs. 602 lbs.	1288 lbs. 1496 lbs.
Total ...	39688	1477 lbs.	2784 lbs.
Average	19844	732½ lbs.	1392 lbs.
(3) Seed of selected ear-heads and graded by passing through a suitable sieve.	25000 22220 21900 26400	917 lbs. 865 lbs. 921 lbs. 1008 lbs.	1488 lbs. 1200 lbs. 1520 lbs. 1200 lbs.
Total ...	96420	3711 lbs.	5408 lbs.
Average	24105	952 lbs.	1352 lbs.

All the above expriments were done in one block and the cultivation was the same to all.

The number of plants plots sown with ordinarily selected and tested seed is nearly the same; while the number of plants in graded seed plots is 20 percent more. The yield of graded plots is higher than those of ordinary and tested for germination plots. It is 50 percent more than the ordinarily selected plots.

The number of Jowar grains per *Tola* are as under:—

One Tola of Graded seed	351 Grains.
One Tola of Selected but not graded ...	395 Grains.
One Tola of rejected seed passed through sieve	582 Grains

100 graded seeds are equal in weight to 113 seeds ordinarily selected but not graded.

To obtain the best results of Jowar the following suggestions are made:—

(1) Good heads of one type should be selected from the standing crops.

(2) Seed should be graded by passing through the proper sieves.

(3) Jowar seed should be steeped in the Copper sulphate solution to avoid smut and to eliminate light seed.

POULTRY-SHOW.

BY

E. J. BRUEN Esq.

(Secretary, Bombay Presidency Poultry association, Poona.)

The Bombay Presidency Poultry Association held its first independent Poultry Show in Poona on the 7th, 8th & 9th January 1928.

2. The objects of such a Show are;—

(i) To give poultry fanciers an opportunity to compare their birds with other breeders' birds.

(ii) To have their birds judged and handled by one who knows, so as they can ascertain from a reliable source the defects in their birds, if any.

(iii) As a medium for breeders to bring to the notice of those interested the type and quality of their birds.

(iv) To collect together the different breeds and types of birds that exist in the Presidency. There is no cheaper way for a student of poultry to learn the types of poultry, and by comparing the outward conformation of the different breeds and types, he can cheaply pick up information which would otherwise be expensive to obtain.

It will be seen therefore that the Show ground is not only beneficial to the exhibitor, but is an object lesson to the student.

3. This year's Show attracted about 130 exhibits, a larger number would have been shown had the Show been more widely advertised. This however was not possible for the want of funds and the obtaining of a site on which the Show could be run cheaply, and yet central for the convenience of exhibitors and visitors.

4. The quality of the exhibits were on the whole good, and especially so in the White Legeorn, Rhode Island Red, Australorp and Light Sussex, all of which promise to do well in Western India. The indigenous classes (i. e.) the Desi, Indian Game and grade sections were poorly patronised, and the quality was also very poor.

5. The judging was in the able hands of Mr. F. G. Christenson, B. Sc. from the John Ackerman Coles Industrial School Kurnool. Seldom has a Judge in India taken such pains over the work entrusted to him. There are naturally a number of persons who will disagree with the Judge's awards. None of those who saw the Judge doing his job, have anything but a good word for him.

6. This Show was purely for utility classes, which has been overlooked by many that were disappointed in the awards. In a Utility Show beauty of plumage plays a big part, but not the most important part; the saying "All is not gold that glitters" is very aptly applied in a Utility Show.

7. After years of patient investigation all over the world, it has been ascertained that birds possessing certain anatomical conformation are the best doers and are the birds that produce the goods.

These can only be ascertained by handling. The eye in a Utility Show is deceptive. By handling and correlating certain measurements the Judge is able to ascertain which are the best doers, head points and plumage helping him considerably in his final choice of the bird, he considers best.

8. The great difficulty in India is that we have imported birds from Europe, America and Australia. Our Poultry authorities are also from different countries and each country has its own type and its own idea of what an ideal bird ought to be. An English Judge may award a prize to a bird passed over by an American Judge and so on. The Judge at a forthcoming Show is a big factor and breeders have come to know the pet points of a Judge and exhibit the type, they know, appeals to him.

9. The Judge at Poona was unknown to any exhibitor and had never judged in these parts before, so even a person exhibiting for the first time stood an equal chance with the more experienced exhibitors. Many good birds shown at Poona were passed over by the judge, owing to the fact that they were badly shown or as is known in poultry circles as "put down". A Judge will not look at a filthy bird, which in addition may have scaly leg or its plumage damaged by mites or recently disfigured head points. These defects show that the breeder takes little interest in his poultry and that his poultry are not being given the best opportunity to do their most.

10. The Governor Cup for the Best Bird in the Show was awarded to Mr. C. W. Condon's Australorp cockrel, a really beautiful bird, which was purchased from the Government Central Poultry Farm, Kirkee for one Rupee. The same bird won the Hon. A. M. K. Dehlavi's Cup for the Best Heavy Breed Bird shown and the Hon: G. B. Pradhan's Cup for the Best Bird bred in India. The Sir Victor Sassoon Cup for the Best Bird opposite sex to the Governor's Cup-winner was also won by Mr. C. W. Condon's Light Sussex pullet. The Sirdar Bamanjee A. Dalal's Cup for the Best Light Breed bird was won by Mrs. S. L. Bruen's white Leghorn cockrel, as was also the Cup for the opposite sex by Mrs. S. L. Bruen's white Leghorn pullet.

11. Some really beautiful recently imported birds were shown by Mrs. V. A. N. Sausman, the 3 breeds shown by this lady "Rhode Island Red and Buff: Rocks, were large winners in Calcutta and were recently purchased at a big price from the Prince of Wales

Poultry Farm in England. The same lady's white Leghorns come from the famous "Gow" strain of England. But these unfortunately did not catch the Judge's eys. He did the job and he knows best why he passed these birds over. It may be possible to give the Judge's report in the next issue of this magazine.

Had it not been for the kind permission of the Public works Department, who lent us the site and the handsome donations from the following gentlemen, we should never have been able to hold the Show:—

(1). Sir Victor Sassoon.

(2). Muratore & Co, Confectioners, Poona.

(3). The Poona Drug Stores.

(4). Rustomjee & Co., Jewellers, Poona.

(5). Khan Bahadur N. M. Metha.

(6). Eduljee & Co., General Merchants, Poona.

(7). The Wilson Anti-Famine Institute, Bijapur.

(8). Miss Gardiner, Poona.

(9). Mr. A. Sausman.

(10). Mr. M. P. Frenchman.

(11). Mr. I. W. Moomaw.

(12). Dr. M. S. Hakim.

(13). Mr. E. M. Hodgson.

(14). Captain Seton Smith.

Mr. T. F. Main, Director of Agriculture kindly gave away the prizes and also gave those present some really solid sound advice. If this Association can get the support of the public, it hopes to make this Show an annual function.

THE ALL INDIA SCOUT JAMBOREE HELD AT BOMBAY.

BY

A. A. VASAVDA. Esq. B. Ag.

Scout master, Rovers troop.

(December 10th to 14th 1927.)

It was a moonlit night on 9th December, when the College of Agriculture Rovers twenty-eight in all from the two troops and seven scouts-sons of College staff members belonging to our farm school troop met in front of the College at 9 P. M. to start for the Jamboree. After prayers and hearty send-off from their fellow students, they started for the station marching in fours with their troop flags waving in front. All were full of enthusiasm, full of cheer and joy at the idea of attending the great Jamboree, which was at that time so much thought of, talked of and discussed by every scout.

At the station a large number of scouts belonging to various Poona troops had already gathered. Slowly and steadily this number began to increase, as troops after troops of scouts from the City, Camp and District Stations of Poona marched in, till about 11 O'clock when one could see a mass of Khaki uniforms with green turbans or hats all over the length and breadth of the Platform. The time rapidly passed in greetings with hearty hand shakes and inquiring after new friends, till the special train meant to convey scouts from Poona, Ahmednagar, Mysore and parts of Southern Maratha Country was shunted in at about 11-45 P. M. There was ample space in the train and all scouts had good sleeping accommodation. Prof. Trivedi, Asst. Provincial Scout Commissionor went round the train to see that every body was comfortable and while doing so, the Scouts in each compartment gave a hearty troop yell of their own. Our Rover Scouts gave their troop cry in their turn, which it may be pardonable to mention, was one of the best and much applauded. It was a grand sight, which brought many a smile to the faces of the station staff, the grim and tired out porter, well wishers and other spectators, to see the special steaming out of the station at 0-30 A. M. on the 10th with troop flags flowing, bands

playing, and a thousand throats giving out scout cries and cheers. I must mention here how cheerfulness is always catching. From the station master down to the porter every body seemed smiling, felt buoyant and younger and they all certainly did every thing to make the Scouts comfortable.

The Parsik Tunnel near Thana gave out mighty echoes of the Scout yells, when the Special was passing through. One felt, as if one heard a great roar as of a huge waterfall. Everybody wanted to reach the Camp as early as possible, but the special had many delays on the way, which reminded us more than once that we were travelling at concession rates. It reached Parel Stati n at 10-30 A. M., instead of 6 A. M. when it was timed to arrive. A batch of Bombay Scouts had come to receive us here. Motor lorries were provided by various Bombay firms and private Individuals, which conveyed the luggage and Younger Scouts. The whole of the Scout contingent led by the Mysore scout band marched from Parel Station reaching the Jamboree Camp at 12 noon.

The Camp in the Worli chawls with an open quadrangle in the middle presented an active and busy appearance with scouts spectators and visitors going about. It seemed as if a new township had sprung up in those otherwise empty chawls. The chawls or blocks were marked with distinctive flags (or lights of night) of the same colour for each section consisting of 6 to 7 blocks. Our Rovers went into block 51 and made themselves comfortable. The same evening all the Scouts had a practice of the marchpast from 3 to 7 P.M. when H. E. the Governor was at the Saluting Base.

Next morning (11th December) our Rover Scouts shifted to Block 76 as Prof. Trivedi, Section Commandant for Blocks 70 to 77 asked me to take up the duties of Block Commandant for Block 76. At 8-30 A. M. the Scouts of Block 76 held their Scout's own under the guidance of the Block Commandant.

At 1 P. M. that day, all the Scouts gathered together in the Quadrangle to go to the Mahalaxmi Race Course for the grand function of the Jamboree—The March Past. To the spectators along the road it was a gay scene to see scouts, young and old, 11000 strong from all parts of India marching in fours with their numerous multicoloured troop flags waving about in the sea breeze and a variety of bands consisting of flutes, trumpets, Bagpipes etc. playing at intervals. It took for the last troop over two hours

from the starting time of the first troop to arrive at the Race Course. Here the Scouts were marshalled into their respective places according to the Provinces of India and the districts of the Bombay Presidency.

H. E. the Governor, Chief Scout for the Bombay Presidency arrived at 4-15 P. M. A number of leading citizens of Bombay specially invited and for whom seating accommodation was made near the saluting base, had arrived by this time and one could see a very large audience from the Bombay Public in the Race Course grand stand which was filled to its maximum limit.

H. E. the Viceroy Lord Irwin, Chief Scout for India and Burma, arrived at 4-30 P. M. After the Royal Salute and Breaking the flag, the March past was begun. H. E. the Governor led the march past, Sir Chunilal Mehta, K. C. S I. Provincial Scout Commissioner for the Bombay Presidency and Prof. Trivedi, Asst. Provincial Commissioner respectively following in order. They fell out at the end of the saluting base and took their stand at the saluting base behind the Viceroy.

The March Past was excellent. Its-never to be forgetton-sight would long remain in the memory of those who had been there either to take part or to see it. It was the outstanding feature of the Jamboree and it was a treat to witness 11000 Indian youths from all corners of India of all castes, creed and colour marching in a body in lines of sixteen linked up together by the same Scout law. Everybody was smart, everybody was gay, everybody was cheerful and tried to do his best. It was a distinct reply to the much talked of communal tension and it filled the hearts of elders with joy just to see so many youths from different provinces, communities, and races going together as a commonbody with the one and common ideal of scout brotherhood. The March Past was over at 5-30 P. M.

All the Scouts then rushed up to the Platform where H. E. the Viceroy and H. E. the Governor next came over and took their seats. Loud Speakers were installed to enable every body to hear every word spoken on the Platfrom. Sir Chunilal Mehta, K. C. S. I. before delivering the address read out messages from Sir Robert Baden Powell, Chief Scout of the world, the Scout Commissioner from U. S. A. and the Chief Scout of Burma and others. He traced the history of the scout movement in india from its infancy up to

date. He added that this Jamboree was a real All India Jamboree as it was noticeable from the presence of scouts in that great gathering, coming from Quetta the extreme north of india, from Ceylon the extreme South, from Bengal and Assam in the east and from Porbandar in the west, not only from the British provinces but also from the States. As a matter of fact, there was hardly any part of India (excepting Burma) which was not represented.

H. E. the Viceroy in addressing the Scouts expressed his pleasure to see the great gathering of the Scouts and the show they had put up. He exhorted all the Scouts to go in for greater efficiency and consequent proficiency in Scouting. Cheers were then proposed to the Chief Scout of the world, Chief Scout for India and Chief Scout for Bombay. The Scouts then marched back to Worli, where they had a campfire coupled with a Cinema Show at night.

The 12th of December was fixed for sight seeing and the Scouts went out in batches to see various parts of Bombay and Round about. Arrangements were made with Railway, tramway, and steamer authorities to afford facilities in travelling to the Scouts. Many a scout saw Bombay for the first time that day. There was a campfire that night again.

On the 13th December some of the troops gave their displays during day time. A conference of all the Scout Masters present in the Jamboree was called by Sir Chunilal Mehta that afternoon and some problems were discussed, some of our Rover Scouts got a special opportunity to come in touch with the Scout Commissioners from Bombay Presidency and other parts of India, when Prof. Trivedi invited them to tea in the evening in Block 76. The same night a huge campfire was lighted by Dr. Annie Besant, Hon. Scout Commissioner for all India and a number of Campfire items were displayed. The Bhil dance by the Bhil Scouts and the legim with lights by Bhor Scouts were among the best. Our Rovers also had a share in it.

The Scouts began to disperse on the 14th. There was a regular exodus from the camp to the Railway Stations from morning onwards and like all other Scouts our Rovers got into a lorry at 1-30 P. M. bidding goodbye to the Jamboree Camp, and boarding the Poona Express at Dadar. They marched back to the College and dispersed after prayers.

Throughout the Jamboree, though the scouts came from all parts of India there was a spirit of oneness amongst them. They

cheerfully underwent various hardships and troubles consequent upon a camping of such a large gathering and an unexpected increase in the numbers.

Our Rover Scouts had had many occasions for Service. Their services were daily requisitioned for serving food, for keeping order at the serving centres, in the distribution of refreshments and at the campfire. They carried out these and various other duties cheerfully. Mr. Bhalerao, Crop Botanist, who belongs to our troop was equally keen on Service and helped in Sanitary work. In fact every body has tried to do whatever he could in his own way, and it is a pleasure to state that the Services of our Rovers at the Jamboree have been appreciated as will be seen from the following letter of Sir Chunilal Mehta received through Prof. J.P. Trivedi.

Bombay dated January 9th, 1928.

Dear Mr. Vasavada,

This is just to tell you and your Agricultural College Rover Scouts how much I appreciate your active work and help at the Bombay Jamboree. I was very much pleased to see their smart appearance and keenness for Service specially as I am personally associated with your troop having first initiated the Rovers and presented them with the flags.

Yours Sincerely
(Sd.) C. V. MEHTA,
Provincial Scout Commissioner.

The Jamboree has taught us many things. It has opened before our imagination the vastness of the movement and its equally great usefulness. It has made us feel that we can be brothers first and can submerge our communal narrowness for the service of the nation and Humanity, Some of the personal qualities, necessary for better service have been developed, and their importance emphasized. Work for others, giving preference to the comforts of others, first self reliance (each member attended to the cleaning of the room and the cleaning of his pots himself) cheerfulness under all difficulties, attendance to details and organisation and the necessity to have a great Self control and discipline for the success of the work specially in case of large masses—these and various other facts are brought out vividly, and it is hoped that every Scout will train himself still further to cultivate these qualities.

THE UNIVERSITY TRAINING CORPS CAMP. 1927.

2/Lt. K. S. KULKARNY.

The regulations of the University Training Corps lay it down that at the end of each training year, which extends from the third week of June to the end of December, the whole batallion will undergo a fortnight's "Camp" life.

Life in a "Camp" even for a fortnight has certainly a number of advantages. It is there that a large body of nearly 600 young men belonging to different tracts of the country come together, live near each other, eat common food and learn to work together for some common purpose-and all this in a perfectly disciplined way. Besides this social aspect, it is in "camp" that a soldier is made to use all his year's preliminary training for the great purpose of a soldier's life viz: fighting to protect what is his. It is in camp he works in a fully 'army atmosphere."

This year's camp was fixed up at Santa Cruz near Bombay, about 2 miles from the now famons Juhu beach. The camp began on the 18th December 1927, the two Poona Companies having left Poona on the night of the 17th by a special troop train. It was a great sight indeed on the Poona Station—the arrival of enthusiastic young volunteer soldiers in a goodly number of nearly 325 strong after a well disciplined March, their entraining in regular order section by section with their rifles of which they felt pround to have a charge at least for a night. All well arranged, the train steamed out of Poona at about 11 p. m. and arrived on the Santa Cruz station at about 5'30 a. m. on the 18th December. It was again an interesting sight to see the companies in full uniform marching from the station to their camp with their kit bags on their back. This lesson of self would not be lost.

The camp had its usual arrangements, the tent, armouries, the men's, "lines," the kitchens, the dining tents, the yellow flags, the hospital with its Red cross, the Officers tents, the Batallion stores and the Batallion Orderly Room or the head office with its unending sereuity and its Guard.

The programme of work included "Physical Training" daily from 6-30 to 8, a. m. company parades, attacks on emenies, defences, route [marches, Batallion parades, ceremonial parades, shooting

practices and competitions etc. between 9'30 to 11'30 and 1'30 to 3'30 and games in the evenings. Physical training this year was a departure from the usual. Instead of the exercises and games, it consisted mainly of "doubling up" to the Juhu beach and a happy sea bath. The attacks and defences were done on more difficult ground. The country this year was more full of trees and shrubs and the land was hard and trodden down with a number of embankments, marshier spots etc. This on the whole, I believe gave a still better idea of fighting in the "unknown somewheres" than what the more open places in the Deccan where the enemy positions could be more easily traced.

Special stress was laid this year on the training of non-commissioned officers, the methods of advances in "blob" formations in quick time instead of the old fashioned "doubling," the high standard of turn out for Guard mounting.

Mention must be made of the two most life like demonstrations given by the 16th Punjabi Regiment which was stationed close by. We were shown the work–as if in actual warfare-of a section each with a "light automatic rifle" and a vicker's Machine gun. The cautiousness and speed with which they run up to *take up positions. take ranges*, open volleys of fire and last but not the least make their best efforts to *see every thing but not be seen*, the care which they take of their invaluable and indispensable friend-the gentle but often stiff headed *Mule*-all these were a real good treat. It is impossible that our young volunteer soldiers could not take some real good lessons about the great *care*, *precision*, *steadfastness*, *perseverence* and extremely *quick* but *silent* and *uncomplained cooperation* with each other. It is here that the different great qualities that go to build man's *character* come into their full relief and force. It was again a big idea to see these powerful machines of destruction throw off in good aim, showers of bullets which literally riddled the spot they struck with a usually unimagined speed of 500 to 1500 shots a minute.

Besides these, there were interesting lectures delivered daily in the evenings to all officers and sergents on different subjects such as methods of attacks, defences, protection, hospital work, sanitation. One of the Officers of the Punjab Regiment also gave an instructive talk on "Mountain warfare" with special reference to the North West Frontier tract. These lectures would certainly be more useful if they could be delivered, if possible with lantern slides, to all the ranks of the batallion since (a) all our men are

literate and would greatly benefit by direct lecturing and (b) it is the ultimate object of the U. T. Corps to train men to be able to "Officer" Indian armies. This is a point which may be considered for future. The Athletics and games consisted of Hockey, Cross Country, Relay and other running races, different jumps and a new item this year was boxing. On the 30th evening a sports meeting was held under the Presidency of Col. Commandant Crawfurd of the Poona Brigade. The trophies were given away by Mrs. Hamil and Col. Commandant Crawfurd gave an instructive advisory speech bringing home the importance of sports and military training. These help to infuse the spirit of sinking one's self for the common good, disciplined and orderly cooperation and the spirit of perseverence.

The "March past" the Inspecting Officer was done in splendid style on the morning of the 30th December and Col. Commandant Crawfurd in a short speech expressed great satisfaction on the good turn out and soldierly bearing. After the March past, companies broke off to demonstrate to the Inspecting Officer the different aspects of training. One company went in for drill movements, ours for field manuovers and a third for range (shooting etc.) duties. It was indeed a point of great encouragement and satisfaction that Col. Commandant Crawfurd spent the whole day and a part of the night in the U. T. C. camp discussing with great interest on various topics military and non-military.

The night of the 25th December was of a more social character and nearly two hours after dinner were spent in various amusements like vocal and instrumental music, exhibitions of feats of strength, speeches etc. Major Hamil Ex. Officer Commanding this Corps gave his usual but highly appreciated "Old king coal" song. The love which the members of the corps have for him was exhibited by lusty and continued cheers.

On the morning of the 1st January began the breaking up of the camp when the Bombay Company left first. The last to leave camp were the Poona and Dharwar detachments which marched up at night to Kurla station from where they left by three different trains. Before each detachment left the camp site the Officer Commanding addressed a few words of advice and encouragement followed by three hearty cheers from the boys to the C. O. and the Adjutant.

The camp on the whole went quite well. The spot chosen for the Camp might have been better still but probably not available

when proximity to the station, rifle ranges and the Juhu beach were matters of greater importance. The weather on the whole was anything but bracing-it being very warm and moist.

On arrival at Poona on the morning of the 2nd January the Companies were "dismissed" for the year to reassamble in June again.

Our College some years back contributed two full platoons to the corps. We won trophies twice. This keenness seems to have gradually gone down. We now contribute only one platoon and we have been ranking low for trophies. This is a matter for serious consideration on the part of the men who join the corps. With a little more effort, perseverence, hardihood and better sense of responsibility and duty and a wee bit of that noble idea of doing what one has volunteered to do-with pleasure-we should find ourselves at the top with ease. We belong to a college which believes in practical work and it is upto its students to show that they really are practical men.

Shall we not gird up our loins and act ?

PRODUCTION OF CLEAN MILK.

(*Received for publication from the Agricultural adviser to the Government of India, Pusa*).

According to the standard adopted by the Ministry of Health in Great Britain, " Certified " milk, which is of the highest grade, must contain less than 30,000 organisms per cubic centimetre. Systematic bacteriological examinations made daily over several years have shown that the milk sold from the dairy of the Imperial Agricultural Research Institute at Pusa, has reached this high standard. The number of plate counts in milk has been found under Indian conditions to reach the maximum in the monsoon, but the highest average in 1926–27 for the month of July was only 26,500. There is no cooling or pasteurizing plant in the Pusa dairy ; thus desirable result has been attained by strict insistence on cleanliness, the use of covered milking pails, and the sterilization of all utensils. Commercial dairies in India can thus produce " certified " milk without laying out much capital. The details of this investigation are to be found in Pusa Bulletin No. 170 which is available from the Central Publication Branch, Post Box 2078, Calcutta, for annas six only.

COLLEGE NEWS AND NOTES

:o:

The term is drawing to a close and all the classes are very busy with preparing for the University Examination. We wish all of them success and expect to find their names in the pages of the first issue of the next year's Volume. The Senior B. Ags are leaving the institution for good after a pleasant stay of three years in the College. We wish them a creditable pass, a happy and prosperous life and request them to cherish the memory of the pleasant days they have spent under the roof of this College.

* * *

Mr. D. B. Kolhe, Demonstrator in Dairying, is proceeding to Bangalore for Research Work in Animal Husbandry and Dairying. We wish him all success. Mr. B. G. Oka, B. Ag. is now discharging the duties of Mr. Kolhe in the Dairy. Mr. Motadoo is employed by the Indian Fertilizer Propaganda.

* * * *

We are very glad to note the success of the Industrial Exhibition at Madras, the Agricultural Exhibition at Kolhapur and the Poultry Show at Poona. After the gigantic Presidency Agricultural Show held in Poona in October 1926, people seem to have fully realised the vast possibilities of educating the masses by such shows. These shows serve as propaganda and will go much towards enlightening the Indian villagers and improving their condition. We are also very glad to note in the paper that a large share in the success of the Kolhapur Show goes to Rao Bahadur P. C. Patil, of our College.

THE MAGAZINE

With this issue we close the present volume and we take this opportunity to thank sincerely all our contributors, subscribers and all other gentlemen who have kindly helped us in our work. We ardently hope that they will continue their help for the coming years also and we wish the new Committee all success.

Our thanks are also due to the Manager and the rest of the staff of the Aryabushan Press for the nice get up of the Magazine in time.

GYMKHANA NOTES.

———()o()———

The beginning of the term was rather an inactive season for most of the students were away on Tour. But soon after the whole atmosphere changed and most of the Departments are very active. The Tennis Singles and Doubles matches of the College were conducted in December and January. The Elocution competition also was held in January. Our hearty congratulations to all the prize-winners.

Tennis Doubles :—

First Messers D. G. Desai and S. K. Jathar.
Runners up „ S. S. Sirur and B. Nazareth.

Singles :—

First Mr. D. G. Desai.
Runner up „ S. S. Sirur.

Elocution Competition :—

First Prize ... Mr. Burhanuddin.
Second Prize ... Mr. Shahani W. P.

Before retiring I wish to express my thanks to the Secretaries of the various Departments who have helped me much in the discharge of my work. I feel much indebted to the other students and members of the staff also without whose help it would have been impossible for me to perform my duties satisfactorily.

B. ISHWARLAL
Hon. Gen. Secretary
Ag. College Gymkhana.

The Poona
Agricultural College Magazine.

Index
1927–28.

THE POONA AGRICULTURAL COLLEGE MAGAZINE.

VOLUME XIX.

INDEX TO ARTICLES.

INDEX TO WRITERS.

Department of Agriculture, Bombay

LEAFLET No. 12 OF 1927

Pig-killing to decrease Damage to Crops

1. A Committee appointed by Government submitted a valuable report upon this crop-pest. It was shown that the wild pig causes Rs. 70 LAKHS worth of direct damage annually to crops in the Bombay Presidency.

2. The chief method of combating this pest that has made fair progress in the Deccan is hunting. In this method which has appealed to cane-growers and grain-farmers alike, guns and dogs are used with the aid of select beaters from the Vaidu tribe.

3. An appointment of a Shikar Officer was created two years ago with the object of decreasing damage to crops in the South Central Division.

4. The Deputy Director of Agriculture, S. C. D., undertakes pig-killing provided the people requisitioning the Shikar Party come forward with half the cost of maintenance of the men and dogs employed on the work, excluding the establishment charges of the officer and his assistant which are wholly borne by Government.

5. Applications for the services of the Shikar Party should be addressed to the Deputy Director of Agriculture, S. C. D., Poona.

6. The Shikar Officer makes a trip to the applicant's village or villages to make an estimate of the damage and total cost of operations and to indicate a scale of payment to the applicants. Work is undertaken at a suitable time after receipt of the people's money to cover half the expenses.

7. The Party works every alternate day and the men and dogs are paid for the working days only. The Party consists of from 10 to 14 men and 14 to 24 dogs. The cost per working day is Rs. 28 to Rs. 36, depending upon the constitution of the Party, to suit the type and nature of cover in different tracts.

B 1994

8. To give an idea of the work and cost per pig killed three statements are given below:—

Places and time.	Type of cover.	Working days.	Pigs killed.	Total cost			Cost per pig killed.		
				Rs.	a.	p	Rs.	a.	p.
(1) Pravara Left Bank Canals. (April and May 1926.)	Cane ...	11	61	253	11	0	4	2	6
(2) Mungi Group, Taluka Shevgaon. (December 1926).	Prickly Pear and Nala Scrub.	6	53	308	11	0	5	13	2
(3) Palshi, Kolawadi Group. (February 1927.)	Reserved Forest, Lantana.	6	35	245	4	0	6	13	0

Pig-killing for Crop-protection

9. The secret of all successful Shikar is to go to the right place at the right time:—

(*a*) The right place means proximity of food and water and a suitable hiding place or cover.

(*b*) The right time means when there is a large pig population in a comparatively small amount of cover affording a large open space outside for efficient work of guns and dogs.

10. To make a conjecture, therefore, about a certain place being right at a certain time answers to the following questions are sufficient to guess the possibilities in pig-hunting, in short, to be able to estimate nearly correctly cost per working day and cost per animal killed.

11. The migrations of pigs from places, near and far away, is factor of note and this factor is entirely controlled by weather conditions affecting growth of crops.

12. It is important to remember that this factor exercises a marked influence even in irrigated tracts.

Questions to be answered by a cultivator when sending a request for the Shikar Party

1. What is the crop receiving damage?

2. Is the country hilly or flat?

If hilly state type—

(*a*) Whether the hills run out in spurs with valleys between?

(*b*) Whether the tops of the hills are bare or are crowned with scrub vegetation?

(*c*) If the country is flat, is it dead level or is it cut up by nalas and hollows?

3. What is the type and nature of cover?

(*a*) *Lantana* scrub, timber and grass?

(*b*) Prickly pear, *nepthad* and *bor* scrub?

(*c*) Bush, *babul* and grass?

4. What is the type of damage?

Describe it as—

(*a*) serious and localized,

or

(*b*) distributed and general,

or

(*c*) stray and occasional?

PRINTED AT THE YERAVDA PRISON PRESS, POONA.

LEAFLET No. 13 OF 1927

Maize and *Tur* in the Gokak Canal Area

Maize is the principal food crop grown in the Gokak Canal Tract and occupies an area of 3,450 acres (nearly one-third of the total irrigated area). Cultivators commonly grow maize after maize in the same year and the lands under this system of cultivation with constant and heavy irrigation are rapidly damaged and the out-turn from the land is decreasing. The supply of manure, too, in the canal tract is too limited to admit of growing two irrigated crops in the same year.

A change in the method of cropping to suit the tract was considered and an experiment of growing *tur* or pigeon pea as a row crop with *kharif* maize, instead of the usual method of taking maize after maize, was laid down on the Gokak Canal Farm in the year 1921-22. The main object of the experiment was to see whether maize and *tur* will give the same or better profits than maize after maize. The secondary objects of the experiment were to introduce a leguminous crop in the interest of the land, to stop over-irrigation and consequently the deterioration of the land, and to save an amount of water and manure in the *rabi* season which can be utilized for other crops with advantage.

The details of experiment were as follows:—Maize after maize was grown according to the cultivators' method, the plants being eighteen inches apart. Maize with *tur* was grown with plants, eighteen inches apart, with one row of Tur for every two of maize. The experiment has been carried out for the last three years and observations and results have been recorded.

Observations.—*Tur* is sown with the maize but grows slowly in the *kharif* season. Maize which is a quick grower takes advantage of the space occupied by *tur* when young and grows more luxuriantly than when it is grown alone. The maize crop is harvested in three months after which the *tur* begins to grow rapidly and spread. Maize with *tur* will admit more interculturings than maize alone, on which

account the crop is earthed up better and does not lodge. This earthing up of the maize is an important item in the successful cultivation of the maize crop as it reduces the attack on the roots by insects. If *kharif* maize unfortunately fails owing to heavy rain soon after irrigation, the *tur* crop still yields a valuable return, while if maize is grown alone the cultivators often lose an entire crop. *Tur* grows luxuriantly in the sandy soil in the Gokak Canal Tract and yields very well, while it requires a smaller number of irrigations than *rabi* maize.

The actual results of the proposed method of growing maize and *tur* together, as against growing two crops of maize in the same year (*kharif* and *rabi*), have been as follows:—

1923-24—

The land had grown sugarcane in the previous year.

A. *Maize and Tur—*

Yield of maize per acre 1,890 lbs. grain and 5,358 lbs. straw.

Yield of Tur per acre 1,919 lbs. grain and 2,848 lbs. chaff.

Net profit per acre Rs. 185.

B. *Two Crops of Maize—*

Yield of *kharif* crop of maize 1,938 lbs. grain and 5,384 lbs. straw.

Yield of *rabi* crop of maize 2,338 lbs. grain and 2,094 lbs. straw.

Net profit per acre Rs. 78.

1924-25—

The land had grown sugarcane in the previous year.

A. *Maize and Tur—*

Yield of maize per acre 2,578 lbs. grain and 1,804 lbs. straw.

Yield of *tur* per acre 1,064 lbs. grain and 1,220 lbs. chaff.

Net profit per acre Rs. 78.

B. *Two Crops of Maize*—

Yield of *kharif* maize per acre 2,658 lbs. grain and 2,486 lbs. straw.

Yield of *rabi* maize per acre 752 lbs. grain and 1,970 lbs. straw.

Net loss per acre Rs. 19.

1925-26—

The land had grown *rabi* maize or maize and *tur* in the previous year.

A. *Maize and Tur*—

Yield of maize per acre 2,760 lbs. grain and 1,750 lbs. straw.

Yield of *tur* per acre 1,353 lbs. grain or 1,260 lbs. chaff.

Net profit per acre Rs. 105.

B. *Two Crops of Maize*—

Yield of *kharif* maize per acre 2,966 lbs. grain and 2,020 lbs. straw.

Yield of *rabi* maize per acre 1,990 lbs. grain and 3,700 lbs straw.

Net profit per acre Rs. 53.

Thus taking the three years together the proposed cropping with maize and *tur* has given an average profit of Rs. 122 per acre, while the double cropping with maize now usual in the tract has given an average profit of Rs. 38 per acre. The proposed cropping has given an extra profit of Rs. 84 per acre on the average.

The proposed cropping needs less irrigation water. Thus maize and *tur* as suggested needs four waterings in the *kharif* season and two waterings in the *rabi* season (for the *tur*), or a total of six waterings. The double cropping with maize needs four waterings in the *kharif* season as before, and six waterings in the *rabi* season, or a total of ten waterings. The quantity of water thus saved can be used for extension of irrigation under the canal.

The proposed cropping also demands less manure. The *kharif* crop of maize needs 7½ tons of cattle manure per acre in any case. The *tur* needs no further manuring, while a *rabi* crop of maize would require 5 tons of cattle manure in addition.

The proposed cropping with maize and *tur* is very suitable for sticky *karl* land, where maize suffers under double cropping.

The advantages of the proposed cropping, under the conditions of the Gokak Canal tract, are, therefore, in short, as against the usual double cropping with maize :—

(*a*) an additional profit of Rs. 84 per acre on the average ;

(*b*) only six waterings with canal water as against ten ;

(*c*) a saving of five tons of cattle manure per acre ;

(*d*) less liability to damage sticky *karl* land.

Further particulars and any help can be obtained from the Superintendent, Government Farm, Arbhavi, District Belgaum.

PRINTED AT THE YERAVDA PRISON PRESS, POONA.

Department of Agriculture

LEAFLET No. 15 OF 1927

Cotton as a Rotation Crop in the Gokak Canal Area

The usual rotation followed by the cultivators of the Gokak Canal Tract is chilli after sugarcane. The chilli crop often suffers from too much moisture during the rains and is subject to the *murda* or mite disease. It is always considered to be a risky crop. The soil which contains numerous rootlets of sugarcane crop holds much water and if there be rains after irrigation, the chilli crop suffers badly. A few cultivators take maize after sugarcane, but this is not considered to be a paying rotation.

With a view to compare the results of cotton as a rotation crop with those of chillies, experiments were carried on for three years from the year 1919-20, and, encouraged by their results, the Gokak Canal Farm has now adopted cotton as the common rotation to the sugarcane crop. The following statement gives details of yields and net profits of both the crops for different years:—

Statement showing the results of Chillies and Cotton in rotation with Sugarcane

Year.	Crop.	Yield per acre.	Value of produce per acre.	Cost of cultivation per acre.	Net profit (+) or loss (−) per acre.
		Lbs.	Rs.	Rs.	Rs.
1919-20 ...	Chilli ...	236	30	133	−103
1920-21 ...	Do. ..	1,296	173	171	2
1921-22 ...	Do. ...	942	171	150	21
	Average ...	824·7	124·7	151·3	−26·7
1919-20 ...	Cotton ...	1,190	216	98	118
1920-21 ...	Do. ...	1,378	151	97	54
1924-25 ...	Do. ...	1,400	233	87	146
	Average ...	1,322·7	200	94	106·0

The secondary advantages of growing cotton instead of chillies after sugarcane are:—

1. The sugarcane crop is harvested in the month of March. There is thus a limited time for preparation of

the land for the chilli crop which has to be transplanted early in June. If the early rains before the monsoon are deficient, the clods of soil have to be crushed and the land prepared under dry conditions in which case the cost is very high. The cotton crop, on the other hand, is sown in the month of August and there is sufficient time to prepare the land even after the monsoon appears.

2. The cotton crop requires three to five waterings with canal water, whereas the chilli crop needs nine to ten waterings. There is thus a net saving of half the quantity of water in the case of the cotton crop which can be utilized for other crops. The point is worth consideration by the irrigation authorities.

3. By growing cotton after sugarcane the land is not water-logged but improves in physical condition.

4. By continuous irrigation to the sugarcane and chilli crops, the fields in the Gokak Canal Tract tend to be spoiled by accumulation of salt. The introduction of the cotton crop is likely to check it.

5. No manure is required for the cotton crop after sugarcane whereas chilli does need from 5 to $7\frac{1}{2}$ tons of farmyard manure per acre. The quantity of farm yard manure in the Gokak Canal Tract is limited and may be utilized with advantage to other crops.

Hints for Cotton-growing

Soon after harvesting the sugarcane crop, the land should be ploughed and left until the rains. After a few showers of rain, it should be harrowed and re-harrowed after removing stubbles. Cotton should be sown with a two-coulter drill in rows two feet apart about the middle of August. Care should be taken not to irrigate the crop until it actually needs water. If the monsoon is favourable, three waterings ought to suffice, otherwise five should be the maximum. Instead of repeated waterings, repeated interculturings will help the crop much. Thinning in cotton has been found to pay on the Gokak Farm and should be practised by cultivators.

With good cultivation and the waterings as suggested, the average yield of seed cotton ought to be 1,100 lbs. per acre. After trying different varieties of cotton on the Gokak Farm a new type of improved Kumpta cotton seed is being distributed in the Canal Tract. Cultivators requiring cotton seed and any further information should apply to the Superintendent of Gokak Canal Farm, Post Arbhavi, District Belgaum.

Department of Agriculture, Bombay

LEAFLET No. 17 OF 1927

Poudrette as a valuable manure on Sugarcane

As grown in Western India, the sugarcane crop requires not only a large amount of manure, but needs this manure in certain definite forms. While on the one hand it needs dressings of concentrated manures like oil cake, fish or sulphate of ammonia, it also requires the use of coarse manures like farmyard manure, poudrette or similar materials during the preparation of the land. Poudrette has been found very suitable for this purpose and the present leaflet tells how best to use it. Wherever poudrette is made and sugarcane is grown full advantage should be taken of it for this crop.

Experiments were made with poudrette as a manure for sugarcane as long ago as 1894, and these proved its value. Since then large numbers of cane growers in the neighbourhood of big towns have taken the benefits of this manure, with the result that in many such places poudrette to-day commands a high price. But when the possibilities of this manure in smaller places like taluka municipalities are considered, there is still a large scope for the manufacture of the material and for its use as a valuable manure for sugarcane.

Careful tests of the value of poudrette as against farmyard manure have been made on the Manjri and Gokak Canal sugarcane farms on three occasions, and the result has been similar in each case. The actual results are shown below:—

	Place.	Manure used per acre.	Yield of gul per acre.
1.	Manjri Farm..	(1) Poudrette, 42 tons...	13,270 lbs. per acre.
		(2) Farmyard manure, 43 tons.	7,885 lbs. per acre.
2.	Manjri Farm..	(1) Poudrette, 22·3 tons.	10,455 lbs. per acre.
		(2) Farmyard manure, 25·3 tons.	7,510 lbs. per acre.
3.	Gokak Canal Farm.	(1) Poudrette, 20,000 lbs.	8,685 lbs. per acre.
		(2) Farmyard manure, 20,000 lbs.	7,490 lbs. per acre.

B 2176

A similar experiment conducted later for three years at the Gokak Canal farm, using the usual top-dressings in addition, gave the following average yields per acre of *gul* :—

Poudrette,	20,000 lbs. per acre...	9,955 lbs.
Farmyard manure,	20,000 lbs. per acre...	8,405 lbs.

In all the experiments poudrette has proved itself a better manure than farmyard manure, and its use is recommended whenever it can be obtained.

Any further information with regard to making poudrette or how to use it can be obtained from the Agricultural Overseer in the district.

PRINTED AT THE YERAVDA PRISON PRESS, POONA.

Department of Agriculture, Bombay.

LEAFLET No. 19 OF 1927.

Sulphate of Ammonia as a Field Manure for the Rice Crop.

In the districts of Thana and Kolaba, the rice crop is taken year after year in the same soil without any addition of manure. Consequently although the yields seem on the whole to be well maintained, still there is an excellent chance to increase the crops now obtained. At present the fertility of the rice fields is maintained to a certain extent by the silt washed from the hills from which the water comes for the growth of the rice crop, but the present yields are by no means the maximum that the soils are capable of producing profitably. Then again all rice lands are not so favourably situated as to receive a full proportion of the silt from the hills, and, as a result, whereas the average yields in Spain and Italy are respectively 4,600 lbs. and 2,850 lbs. paddy per acre, the average of the two districts Thana and Kolaba is only 1,700 lbs. of paddy.

Experiments conducted by the Agricultural Department at the Karjat Rice Research Station and verified at other places, have shown, however, that with good seasons, it is possible to get outturns up to 4,000 lbs. of paddy per acre by manuring.

Of all the manures tried, Sulphate of Ammonia has been found to be the best and the cheapest at the present prices. It can be easily applied and is not, according to the experiments made, liable to be washed away by the heavy rainfall of the Konkan. The actual results of experiments over a number of years show that a dose of 300 lbs. of Sulphate of Ammonia per acre is the most profitable one with increases ranging from 25 to 50 per cent. in the paddy harvested according to the season. This means an increase of from 700 lbs. to 1,200 lbs. of paddy per acre, of the value of Rs. 35 to Rs. 60, while the cost of the manure at the present prices is Rs. 30.

B 2209

Method and time of application.—The manure should be broadcasted near the roots either alone or mixed with dry soil if possible. Before the manure is applied care should be taken to clear away all the water in the field and both the inlets and outlets should be kept closed for at least three days, during which period no amount of extra water should be let in. The manure should be applied at periods when either there is a break in the rains or only light showers are anticipated after each application.

The maximum results are obtained when one-half of the dose is given three weeks after transplanting, one-fourth being given two months after transplanting and the remaining one-fourth just before flowering. By such a method of manuring the manure is more economically and efficiently used by the plant at the particular stages of growth when it is most required and so yields heavier earheads.

Sulphate of Ammonia in lesser doses of 200 lbs. per acre and even in still smaller amounts has been found profitable and, therefore, such quantities as can be obtained should be used. In rich soils near villages or where the silt deposited on the land is abundant, Sulphate of Ammonia should be used with caution and will probably not give such good results.

Sulphate of Ammonia can be had from any firm or merchant selling manures either direct or through the nearest officer of the Agricultural Department, through Taluka Development Associations or through Co-operative Societies.

CONTENTS.

THE

Poona Agricultural College Magazine.

VOL. XX.] JULY 1928. [No. 1.

V. G. DESHPANDE, M. Ag.
S. M. RAO, B. A.
Editors.

PRICE As. 10.

Printed at the Aryabhushan Press, Poona City, by ANANT VINAYAK PATVARDHAN, and Published by PRAMOD KULKARNI, at the Poona Agricultural College, Poona.

CONTENTS.

THE

Poona Agricultural College Magazine.

VOL. XX.] SEPTEMBER 1928. [NO. 2.

V. G. DESHPANDE, M. Ag.
S. M. RAO, B. A.
Editors.

PRICE As. 10.

Printed at the Aryabhushan Press, Poona City, by ANANT VINAYAK PATVARDHAN, and Published by PRAMOD KULKARNI, at the Poona Agricultural College, Poona.

CONTENTS.

——():o:()——

THE

Poona Agricultural College Magazine.

VOL. XX.] DECEMBER 1928. [NO. 3.

" Two men I honour. First, the toil-worn craftsman that with earth-made implements laboriously conquers the earth and makes her man's. A second man I honour and still more highly him, who is seen toiling for the spiritually indispensable, not daily bread, but the bread of life."

Thomas Carlyle.

V. G. DESHPANDE, M. Ag.

S. M RAO, B. A.

Editors.

PRICE As. 10.

Printed at the Aryabhushan Press, Poona City, by ANANT VINAYAK PATVARDHAN and Published by PRAMOD KULKARNI, at the Poona Agricultural College, Poona.

CONTENTS.

THE

Poona Agricultural College Magazine.

VOL. XX.] FEBRUARY 1929. [NO. 4.

It is hardly realised that no amount of research on crops, fertilizers and pure seed—though valuable in themselves—will improve the condition of the peasantry until we study the ryot's life as a whole and in parts.

V. G. Kale.

President, Twelfth Indian Economic Conference, Mysore.

V. G. DESHPANDE, M. Ag.

S. M. RAO, B. A.

Editors.

PRICE As. 10.

Printed at the Aryabhushan Press, Poona City, by ANANT VINAYAK PATVARDHAN and Published by PRAMOD KULKARNI, at the Poona Agricultural College, Poona

THE POONA

AGRICULTURAL COLLEGE MAGAZINE.

VOL. XX.] JULY, 1928. [No. 1.

EDITORIAL NOTES.

With this number we enter upon the Twentieth year of our Magazine. Looking to the financial side and the membership it will be seen that it is making a steady and sure progress. As regards the contributions we may remark here that we do receive them from all divisions alike. But we take this opportunity of requesting all the staff from the districts and the practical workers to note their difficulties and disabilities while working. Such experiences are really valuable. They will not only be helpful in showing the impracticability of some of the scientific methods in vogue, but at the same time they will set up other workers to devise changes if they are really needed.

* * * *

2. The great and important event that took place in Poona, since the publication of the last issue, was the unveiling ceremony of the Shivaji Memorial by His Excellency the Governor of Bombay, the foundation stone of which was laid by H. R. H. Prince of Wales. The Memorial of the Great Founder of the Maratha empire is in the form of a Bronze statue on Horse-back. The work has been done by an Indian Sculptor,—Mr. V.P. Karmarkar—who certainly deserves all praise and congratulations for this exquisite piece of workmanship—the first of its kind in the whole of India. While performing the ceremony, H. E. the Governor in his speech paid a glowing tribute to the memory of that great person who was aptly discribed as a *Great Statesman and soldier*. The statue is situated at a very prominent place towards the north side of the New Bridge and the imposing sight of that great Indian will, it is hoped, be a constant source of inspiration of the right spirt in the minds of all the onlookers, and especially in the minds of the young generation.

3. In the *Review of Agricultural Operations* in India for 1926–27 published by the Agricultural Adviser to the Government of India, in Chapter X, very interesting information is given under the heading–Receipts and Expenditure of the Agricultural Departments. In a tabular Statement are given the Receipts and Expenditure for all the Departments—Imperial and Provincial, from which it will be clearly seen that the net expenditure for them comes to Rs. 1,03,50,173. It works out at about 9 pies per acre of cultivated area and 8 pies per head of population in British India. As compared with total revenue, the Provincial Governments, out of 90 crores of Rupees are spending only a little more than 1 percent, and the Central Government only ·07 percent for the development of Agriculture—India's basic industry.

These figures are compared further with those of other advanced countries like the United States of America, and Japan. The former country where only 30 percent of population as against 78 percent in India is engaged on land, the amount spent on its agricultural department, works out to 6 annas per acre of land under cultivation or approximately 8 times as much as India spends per acre. In Japan with only a population of 59 millions, the total expenditure on Agriculture department, works out to 5 times that in India.

It is thus clear that India is spending far less on the Agricultural department, the activities of which are the Agricultural Research, Education, Demonstration and Propaganda.

In discussing about the Research, the Agricultural adviser remarks that Indian Agriculture has reached a stage, at which in order to prosper, it must progress; and the progress must be based on Research. With regard to Research workers, he says that India is suffering from a dearth of trained men and adequate provision must be made for their training. But at the same time he remarks, that the demand for such men is very small and if more research workers are produced, they would fail to find employment. How to reconcile these two statements?

At any rate these are some of the bare facts which present the situation in the true perspective. All these facts have been brought in the evidence before the Royal Commission on Agriculture, and the big and comprehensive report of the Commission which is said to contain a long list of recommendations, will, it is hoped, provide for satisfactory solutions.

FAREWELL ADDRESS TO B. Ag. STUDENTS

BY

PROFESSOR B. S. PATEL, B. Ag., N. D D. N. D. A.

GENTLEMEN,

It is a great pleasure to me to have this opportunity of addressing to you a few words on behalf of the members of the staff on this occasion of farewell to you.

Perhaps the foremost thought in your mind may be of the present examination for which you have been working at this college for the last three years. It is quite natural and I offer the best wishes for your success in this test by the University.

However after the result is out, your thoughts will turn to a greater problem viz. your future career in life, and you might find that it is not as smooth a sailing as the college career. Sometimes you might be inclined to doubt the utility of your training at the college for the battle of life.

I am afraid it may prove true, if the time you have spent at this college has been spent merely for the superficial study of various subjects through lectures and practical classes, with a view more for passing the usual examination test rather than for fitting you for the battle of life.

Educationists all over the world are now agreed that the proper education lies in training the hand, heart, and head. This college is admirably fitted for the training of these three "H s"

The work you have been expected to do on the farm and in laboratories must have given you ample training of the hand, provided you took real interest in that work and set to work with the object of getting the best out of it.

The ample provision for sports of all sorts has given you another chance of training your hand and physique. A sound body is a very great asset to yourself for a successful career in life. If you consider the most advanced and prosperous nations of the world, you will find that the majority of their people depend upon earning their living. not only by brain but by a suitable combination of brain and brawn and usually there is a greater demand on the body

Even if you take the oldest country and most populous country of the world as China you will find that the Chinaman beats every other national in the world in the skill and efficiency at any practical job, and that alone enables him to earn a living under any circumstances in any part of the world.

In India we have two classes of people. One class is out to earn its living only by brain and the other class–the vast majority of the population-has to depend only on its physical labour.

Unless we bring a happy union of both, in our educated young men who are going to be the future leaders of the rural community, we shall have very little chance of improving the lot of our people, which would mean that we will never be in a position to come up to a high pitch of national development.

Now second question is that of training the heart. The sports, the various social activities of the college, the opportunity of living amongst such a cosmopolitan community of students and members of staff, the scientific habit of thought and action, the provision of working with your own hands in the field, and the close study of rural conditions of life, are bound to have instilled in you the true spirit of sportsmanship, the spirit of good will and honesty, the true spirit of a scientist and above all the spirit of service of the community, provided you have applied yourself in all seriousness to your task at the college during the last three years. This college has built up noble traditions and has a high rank in the colleges of India. Even these traditions should have demanded a high standard of work, character building, spirit of good will and service from you. There should have been no room for any narrow communal or provincial spirit if you are to go out of the portals of this college as graduates best fitted for the battle of life. The narrow communal spirit or provincial spirit can give at the most some little advantage, but it connot help to increase your efficiency nor can you guarantee that the spirit would not be used against the interest of society as a whole.

This college has offered you unique opportunity for training your hands and hearts and has also automatically helped in the training of your head and if you have played your part well in all these activities of the college, I am sure, you are bound to have the best equipment for the battle of life.

I would like to request each of you, to take stock of what you have done, and the spirit and enthusiasm, with which you have acted your part in various activities of the college during last three years,

and search your heart to find out to what extent you have done your duty in the task of preparing yourself for the wider activities of life. The answer to this question is important if you are yet to make up the deficiencies in your equipment.

To earn a living by securing a job somewhere or by retaining a job somehow should be a poor satisfaction to an educated youth. Of course you have to make your living first. But your aim in life cannot end there. You should try to give the best service to Society whilst earning your living.

Your ideas by this time must have been crystallised, your plans for the future must have been well thought out, and if you have not wasted your time at the college, I think, you should find no difficulty in finding a suitable task for the uplift of the society wherever you go.

Your success at the college, or your popularity amongst the students and the staff, would give you some confidence and advantage in making a start; but if you have not developed the qualities of heart or rather not built up what is called "a character" you will have poor chance of success in life. It often happens that the best student at the college or the most popular student at the college may fail in the test of character, and may be of very little use to the Society which has paid for his education. So my advice to all of you is, do not be content with these achievements at the college, though they are very valuable, but go further and compare yourself with similar batches of young men that are ready to come out of any of the colleges of other countries. Students in foreign lands have no communal drawbacks and are not afraid of hard work, mental or physical. Even in vacations they go out to get practical training and even to earn a livelihood. This gives them real training for life and they are bound to be very efficient for the service of the community as workers as well as leaders.

Our students idle away their time in vacations and thus they get into idle habits, which take some time to overcome when they go back to the college. If the college authorities can organise a movement to keep the students engaged in some sort of work, either of learning some trade by working with their hands and earning a little money, or of doing some social work in the rural area, they would be better fitted for the service of the community as graduates.

I have asked you to compare yourself with other nations of the world, simply because, the world is getting smaller and smaller

every day. There are so many international organisations afloat. There is the League of Nations, the International Students' Conference, the International Women's Council, the International Olympic Sports and so on. All these show that the nations of the world are trying to come closer and closer together.

It seems that there is an under current for universal brother-hood. But the consummation of that idea is delayed simply because all nations are not equally efficient. This contact of various nations would stimulate the desire for equal efficiency. You have to fit into this world movement. If you, the would-be leaders of the community are not equipped as well as those of other countries, what chance is there for your success as individuals and as a nation amongst the peoples of the world?

Our economic existence is dependent on the economic conditions of other parts of the world. There is close relation between the economic, social and political conditions. Under these conditions of the world competition if you are poorly equipped for the higher responsibility of serving the community you are bound to keep down the country in comparison with other countries of the world. Other countries have besides many advantages over us and thus your task becomes greater and accordingly your preparations too should have been greater. You have had enough talk of patriotism. Now it is time to prove your patriotism by doing the work.

If you still realise your responsibilities, it is not too late. You will have ample opprtunities in life to correct your ideas and actions if you are determined to do so. I would therefore appeal to you to strive for nothing less than the best individual efficieny, the best family efficiency, the best village efficiency and even the best communal efficiency, the best provincial efficiency, the best presidency efficiency and the country will rise in efficiency. I wish you would view your past and future thoughts and actions in the light of these. and I am sure if you achieve even the smallest thing in this line of efficiency, you will feel the greatest satisfaction in life, which no amount of wealth can purchase.

Gentlemen, your responsibilities will be increased many-fold as soon as you leave this college and if you remember the days of hard work you have spent at the college and the high traditions and the spirit of the college in all you do, I am sure you will succeed in your new activities of life and be able to add to the achievement of the college and the country. With these words, gentlemen, I bid you farewell.

CHEMISTRY AND AGRICULTURE

By

RAO BAHADUR PROF. D. L. SAHASRABUDHE, M. Ag., M. Sc.

Agricultural Chemist to Govt. of Bombay.

(By kind permission of Indian Broad Casting Company.)

I propose to give, to-night, a short talk on the relation of Chemistry to Agriculture and the importance of that science in the progress of agricultural industry. I hope it will not be considered out of place if I roughly give an outline of what, in my opinion, can be included under the term "Agriculture." Management of soils ; growing of grains and oil seeds, vegetables and fodders, fruit trees and commercial crops, such as sugarcane, cotton, tea or rubber ; stock-breeding and dairying and finally the disposal of the products. All these come under the term ' Agriculture. '

2. It is a well-known fact that agriculture, which has been practised for centuries together as an art, was carried on till very recently without the help of science, and it must be acknowledged to the credit of the former generations, that they made the best use of their experience and brought agriculture to the highest level possible under the conditions of the pre-science days. Now, however, when the demand for food-supplies is increasing day by day and when every industry in the world is being improved with the help of science, agriculture cannot afford to remain behind in the race. Experience tells us that the rule of thumb must go and the rule of science must take its place. We have an immense store of empiric facts relating to agriculture accumulated by long experience, but these cannot be properly correlated and made full use of until science provides the requisite explanation.

3. Perhaps there is no branch of science which is more intimately connected with Agriculture than Chemistry. The science of Chemistry has made such rapid strides during recent years that it has spread itself into all the industrial occupations; and agricultural chemistry has become a branch by itself, involving separate and special study. I shall, therefore, endeavour in the short time at my disposal, to show how Chemistry has been utilised and should be utilised for the improvement of agriculture.

4. There is a long standing practice of burning soils in certain parts. It was followed because it was found by experience to be useful. But as long as the underlying principle was not understood the practice could not be extended or restricted to conditions to get the highest benefit. It was the chemical study of the soil, which showed that burning made the plant-food in the soil more available, it improved the physical condition of the soil and destroyed most of the orgainsms of the soil making it fit to support only the vigorous and useful ones. Such and similar information made available by chemistry enables us to understand how far we should extend this practice or restrict it, and whether it can be replaced by any other method and so on.

5. The study of the reaction of soil in relation to plant-growth has come into great prominence and the Commission of the International Society of Soil Science have, during the last few years, given much of their time to the study of soil reaction. The study of soil acidity is making a far greater demand upon chemical research than anybody would ever have thought possible a quarter of a century ago. It is expected that when plants are grown on soils with reaction suited to them, they will be healthy and will yield proper outturns. A few years ago it was observed in some of the rice fields of North Kanara district that circular patches of infertile soil were developed, which increased in size year after year. A chemical study of the soil revealed the fact that the soil reaction indicated want of lime. As soon as the defect was removed the infertile patches immediately gave yields equal to those of the fertile soils. This knowledge now enables us to deal with such patches under similar conditions.

6. It is a well-known fact that salt lands have developed along the canals in the Deccan and several thousand acres have gone out of cultivation. We have now become wiser, and have appointed a special chemist in Sind to study the effects of perenial irrigation on the chemical and mechanical condition of the soils in Sind and to invent measures to prevent or at least to mitigate the bad effects, if any, are produced. There are several problems in connection with soils which await the attention of chemists. The solution of these problems will lead to increased supply of food.

7. The use of manures to crops is not a new thing but the study of the chemical constituents of the plants and the manures has practically revolutionised the methods of manuring. We know now what manures to give and when we must give them to obtain

the best results. We must admit that our knowledge is as yet far from complete, but we are much better informed now than we were a few years ago. Our study of green manures tells us clearly why leguminous crops are better than cereal crops for green manuring. On the roots of the leguminous crops are small nodules in which certain organisms reside. These get their carbohydrates from the plants on which they grow and the nitrogen from the air of the soil. They build the nitrogen into proteids which are drawn upon by the host plants. This action stops when the host plants come into flowers. This is the best period in the life of the plant for manurial purposes. At this stage it gives the highest nitrogen and is in a good condition to decompose in the soil. Chemical study has also shown that the leafy portion contains most of the nitrogen and not the roots as is the impression of non-scientific people. Nitrogen is a very important plant food constituent and the demand for nitrogenous manures is increasing. Chemists have already invented several processes of fixing atmospheric nitrogen for manurial purposes and they are still working at the problem to obtain the cheapest possible method.

8. It is almost unnecessary to mention the use of the science of chemistry in the preparation of plant products, such as indigo, rubber, sugar, starch, cellulose or fibre, essential oils etc. or in the curing of tea or tobacco. Preservation of fruits by drying or canning, preparation of jams and jellies, fruit syrups and fruit juices all require knowledge of chemistry if they are to be prepared economically and in the right fashion.

9. In the feeding of animals we are practically entirely guided by the science of chemistry. The chemical analysis of food-stuffs, the changes which they undergo in the alimentary canal, and their digestion coefficients, have all been worked out by chemists and the results obtained have been found to be of great value in economising the feeding of animals. Chemical study has enabled us to prepare food rations for different conditions. Preparation of suitable animal foods from unsuitable or waste materials is engaging the attention of the chemists and this, I am sure, will open out new sources of food for animals.

10. Even in the field of implements we cannot do without chemistry. It was only a few years ago that a great implement manufacturer told me that he had no use of a chemist in his factory Later on he had employed one for some work and soon found that a chemist was as essential as a good mechanic for his work.

The chemist helped him in getting the right sort of iron in preparing paints at a low cost and in utilising several of his waste products.

11. I have given you only a few examples to show the close and intimate relation of chemistry and agriculture. The examples can be multiplied a hundred times.

12. Whether we are dealing with soils or with manures, with plants or plant products, with feeding of animals or dairy products, with fungicides or insecticides, we are living in the domain of chemistry and therefore the more we are guided by the science of chemistry the greater will be our achievements.

ENGINEERING AND AGRICULTURE.

BY

PROF. J. P. TRIVEDI, L. C. E., A. M. I. E.

Professor of Agricultural Engineering &c.

College of Agriculture, Poona.

(*By Kind Permission of Indian Broad Casting Company*)

It has been very rightly said, that no invention has so materially revolutionised, the mode of life and habits of man, as the invention of the art of building a house. Man invented a shelter to protect himself from the exigences of weather and the depredations of wild beasts. And provision of a shelter, or, a house, made him give up a roving life, and, settled him to a place. The beasts of chase, and roving flocks, and herds, sufficed, until men became more numerous, and, settled down, and cultivated a family life. This made social life and agriculture, possible and, the taming of some of the beasts, for domestic service, was undertaken. Thus dawned civilization. The establishment of society, in however a primitive form, and, the Art of Agriculture, however crude, the two signs of civilization, and the chief important steps, in the

progress of mankind,can be traced to that important invention. The chi.f aim of men, in those days, was to live like a Rob Roy, and there was little wonder, that arable farming was not practised or did not improve, when, a man might sow a crop but could not tell, who would reap it. And this great change was due to our primitive, but ingenious inventor the Engineer of the primitive days.

The progress of Agriculture, at each step is advance in its early days, was closely associated with some mechanical adaptation to the work of Agriculture.

The first important step was the use of a plough. The plough, as a tool for turning over a furrow slice is of comparatively recent evolution. It was preceded for many ages, by the use of a manual tool, resembling a sort of large pick. Its gradual evolution is a history in itself which would be dealt with in my next talk, yet it is not the final word, as a tillage implement. The engineer is evident again.

The second great step, was, a knowledge of the wheel, and, its adaptation to the practical work of agriculture. It needs only to be pointed out, how this was made use of, first, in the construction of carts, which made it possible to carry the produce of the farm, and then, in providing a pulley, to draw out water from the well, which made it generally possible, to irrigate crop. It would be really interesting to know, that our Mot, with its remp, and, the little ingenious self-draining arrangement, is a creditable engineering feat

In early times, when, the population was scattered widely, over the land and their wants were few, and, easily satisfied, the spontaneous products of the earth, scanty as they were, would amply suffice. But, as the people increased in numbers, and civilization progressed, attempts had to be made, to increase the products of the land, by the efforts of industry and skill. Land is employed for producing crops, live-stock and timber. Formerly, we had ample supply of good land, on which, to draw for crops, and large areas of forest lands, on which, to draw for timber, and, large areas were available, for grazing. This condition is changing. Some of the best land, suitable for growing crops, is being occupied, and, some is being spoiled. A fairly large area has some disadvantage, which prevents its use for crops. This requires an Engineer's hand. Again agriculture has to face keen competition with Industrialism It has

been rightly emphasised "that Agriculture must industrialize to the extent, that, it can produce enough. in one hour, to exchange, in the markets of the world, for that, which the man of industry produces, in the same time. Agriculture must learn to think in terms of industry, along production lines, namely, to measure production in terms of output, per worker, and, not only in terms of output per acre". Farm operating equipment, is directly related to the labour employed, in farming operations. The question of labour, is tremendously important. Of all the items, entering into the cost of production, labour is the one, most susceptible of modification, and, reduction by the application of engineering principles. Mechanical power and modern machinery,places in the farmer's hands, the only effective means of reducing the labour item, to the minimum. The improved implements and mechanical farm equipment increases the productivity of land, and keeps down the cost of production. This has, also a very significant influence on the character of the labour.

Thus Agricultural Engineering is the name, given to the agricultural achievements, which require, for their execution, scientific knowledge, mechanical training, and engineering skill. It embraces such subjects as (1) Levelling and bunding (2) Drainage (3) Irrigation (4) Farm machinery and (5) Farm motors, and, also, Farm Road construction, and, Rural architecture, Black-smithy and Carpentry.

The vast scope for the operations, of levelling, and bunding, should have been evident to those, who have travelled by motor to Mahableshwar, and, especially are these very strikingly seen, in the Konkan tract, if one has travelled by motor from Ratnagiri to Kolhapur. The steep hill side slopes are brought under cultivation, by terracing and levelling. The streams, which otherwise would have scoured more and more, into wider and deeper valleys, are by bunding being stilted up, into level strips. On the plains, the intelligent construction of field bunds, have stopped, the soil erosion, during rains, and, have helped to conserve more moisture, there-by helping scanty rainfall, or tiding over a long break. Judicious bunding, of some of the depressions, in Gujarat has, by increasing the sub soil percolation, helped the supply of water in wells, and, raised the sub-soil water-level.

Bunds have been effectively used to stop the encroachment of salt water near the sea-coast, and are utilised, to reclaim the salt land by washing. The design and construction, is to be adopted, for the specific purpose, and is to be modified, for each particular case.

Those, who have studied the effect of irrigation, in the Nira and Godavari valleys, are distressed at the increase, of the water logging area, and salt efflorescence. The remedy is Proper Draining. Experiments of the Nira Canal at Baramati, have definitely established the usefulness of the drains, and, we have learnt the best methods of draining, in these conditions. This, one of the most important, of the mechanical means of improving the soil, has been studied, and, adopted on a large scale, in America, where, the conditions are, of course, a bit different. There, the pipe drains &c., are constructed to the great benefit of the land, and the crop.

The connection with, and, benefit of irrigation to agriculture need no mention. Water is made available to crops, from the very large irrigation storage tanks, like those of the Deccan, as well as, from a Picotah, worked by a solitary man. Cultivators have been using, more and more, the sub-soil, and surface flow water, by means of cheap water lifts and pumps, worked by animal power and oil or steam engines. The water lifting devices are many, the power is being supplied by gas and steam engines, which are very much simplified now, in constructional details, and, are easy to work.

Very great strides are made, in the development, and manufacture of farm machinery, and farm motors. The Year 1850, practically marks the close of the period, in which, the only farm implements and machinery, other than, the cart and cotton gin, were those, which, for want of better designation, may be called implements of hand production. The use of iron implements, and machinery, has revolutionised the agriculture. A man with a spade can dig an acre, in two or three weeke. Give him a tractor, and his output can be four or five acres a day. Not only is the output increased, but the operations are carried out, more quickly, which is of the greatest importance, in both cultivation and harvesting operations. One has only to go over the sugar-cane tract, in the Deccan, and, he would be surprised to find, how the whole area is being dotted, with cane-crushers and oil engines, with, improved cane juice boiling furnaces. Agricultural prophet has foretold, that, the agricultural workman will in the future be a man "to mind machines". This, of course, is an exaggeration, as many operations, both on the land and with stock, must always require the personal touch of the skilled human worker. The improved implements and machinery will relieve the labour of much drudgery, will make his work, and his hours of service shorter; will stimulate his mental

faculties; give an equilibrium of effort to mind and body; make the labourer a more efficient worker; a broader Man, and, a better citizen".

A lot requires to be done in providing better sanitation and housing, for the farm-men and cattle, both as regards caste and design. This field of work has not been touched at all, here as yet.

Large hydro-electric works are being carried out in the Deccan. Perhaps in the dim future, we can trace in a pretty little farm-house the intelligent, happy couple after the day's work, reading to their bonny children, by an electric light, and some of the operations on the farm carried out by an electric motor. Who can say!

PRESERVATION OF SUPARI (BETELNUT) FROM MOULD.

BY

V. S. HABBU Esq. B. Ag.

Superintendent, Kumta Farm.

Preliminary:—Supari soon after harvest is husked, boiled and then dried in the sun before it is brought to the market. A well dried sample should be very hard to the cracker and should give creaking noise. Well dried supari can be kept for a long time without deterioration. In drying too it should be continuous.

I. Supari harvest commences along the coast from the middle of August when it becomes very difficult to get sunny days for drying as there are rains or the sky is cloudy. During 1927-28, August had rains almost every day. In September there were rains for 15 days, and October too had rains during the first fortnight. So undried Supari is required to be kept in the house under shade. If kept in an undried or half-dried condition, mould develops deteriorating the quality of the produce and consequently affecting the price. Owing to this inability of drying, the external colour darkens and the nut inside is full of mouldy dirt. The prices are thereby affected to

the extent of 25 p. c. to 40 p. c. The total quantity that comes to the market during August, September and November may be roughly estimated at 6000 India maunds, and the total loss may be estimated at Rs. 12000 to 15000 taking the price at 6 per maund, and reduction in price at 25 p. c. It is not that the produce that comes hereafter is all good. But if the stock is bad it is due to the growers' fault.

II. Again the cultivators have got the habit of bringing to the market incompletely dried Supari under the impression that the moisture-contents add to the weight and hence they would get more money. Samples containing as such as 20 p.c. moisture were found. This stuff is required to be sold off the same day it is brought to the market even though the market be dull. It cannot be kept as it develops mould. So the cultivators are at a disadvantage owing to season and also place themselves at disadvantage by their own actions and lose an enormous amount.

III. In the above Ghats, the season of Supari commences about December. So the gardeners do not experience the disability of season. But they too have got the habit of bringing incompletely dry Supari into the market.

IV. The cultivators and even the local merchants are of opinion that the below-ghat Supari, however well dried, does not keep well during the monsoon. So they generally dispose of this produce at any price before the rains commence. This is another disadvantage. Supari from upghats is said to keep well. If held over through the monsoon the Supari gets better price about August and September when the first supply is very limited.

V. Cardamom is a crop which is harvested in August i. e. in full rainy season. If not quickly dried, it also develops mould, loses external colour thus reducing the price.

VI. What is most needed is a device to keep the commodity in good condition for at least 10 days. The rains being not continuous are followed by sunny days. The market prices too fluctuate within that period. The dullness of the market at Kumta is believed to be due to two reasons. viz. the demand and the supply. Bombay is the chief market for Supari and the purchases at Kumta are encouraged or discouraged depending upon the clearance of the stock in the go-down in Bombay. In the busy season a large quantity comes to the market all at once. The produce brought for sale on any particular day may be roughly estimated at 400 to 500 bags. As there is a system of cash payment, the merchants' capital is lock-

ed up if there be no ready sale in Bombay. This makes the local merchants stiff in making purchases. In about 15 days the stock in Bombay is expected to get cleared of, so it is highly probable that the market may improve in tone in a fortnight.

Sulphur fumigation is said to be resorted to in keeping dried figs and copra etc. Sulphur is now used against parasitie fungi. As Supari is used for edible purpose the only course of treatment was by fumes. So an experiment was undertaken to see how far sulphur fumigation was useful in keeping back mould.

For the first trial a sample from the stock brought for sale was taken. The sample contained 18 p. c. moisture. Half of it was treated with sulphur fumes and half kept untreated. Both the samples were kept in bags for 3 days. The treated sample showed one and all nuts free from mould whilst all the nuts in the untreated portion were full of mould. This was repeated with a sample containing 20 p. c. moisture with the same amount of success. This preliminary result encouraged me to take up further study in greater details and the experiments so undertaken are described below :—

1. Firstly, boiled, fumigated and unfumigated samples were kept exposed to air in bags. The samples contained more than 40 p. c, moisture.

(a) Without exposing to the sun at all
(b) After 12 hours exposure to the sun
(c) After 24 hours exposure to the sun
(d) —Do— 36 hours —Do—
(e) —Do— 48 hours —Do—

The treated samples under (a) showed the signs of mould for the first time on the 12th day whilst the untreated both in bags and that spread in the open developed mould on tbe 3rd day. Those (untreated) in bags were very bad. In five days the samples in the bag darkened in colour aud outside and inside were full of mould.

The treated samples under (d) kept in good condition for 14 days when the nuts got affected. The untreated under this developed mould on the third day after taking the sample, and it was as bad as the untreated in (a).

The treated sample under (c) remained in good condition or a fortnight when it was dried in the sun. The untreated got slightly affected on the 4th day and the mould developed and affected all the nuts in 7 days.

The untreated samples under (b) and (e) did not develop mould to a great extent within a fortnight's period. The percentage affect-in (d) was 18 p. c. whilst in (e) it was only 5 p. c.

The colour of the samples improved on fumigation and the advantage on this score was estimated at 5 p. c.

To corroborate the above results moist-chamber trials were undertaken.

I. *Whether excess in atmospheric humidity encourages mould.* Well dried, treated and untreated samples were kept in a moist chamber and a record of absorption of moisture maintained. In 7 days the treated and untreated samples absorbed 7·18 and 7·91 p. c. moisture respectively. On the 8th day mould appeared in both the samples. But it was severe in the untreated. In 14 days period the treated and untreated absorbed 9.2 and 10.4 p. c. moisture respectively. The former except for a few very small patches of mould was in very good condition. There was no deterioration of colour and the inside was quite sound. The untreated sample was full of mouldy growth, on the external surface dark in colour, and the nut inside was also full of mould and darkened in colour.

II. *Whether moisture contained in the sample encouraged mould.* Wet Supari containing 37 p. c. moisture was taken. One sample was treated with sulphur fumes and the other left untreated. Both were kept in a dry chamber. The daily loss in moisture was being recorded. The loss for the first 3 days was very rapid showing 15 p. c. in the treated and 16. 25 in the untreated. The treated sample remained in good condition throughout, i. e. until it showed its constant weight for 17 days, whilst the untreated developed mould on the 3rd day. This corroborates the results of the mass treatment.

III. *Whether mould is contagious and under what conditions.* (a) Dry Supari was kept in close contact with a very mouldy sample to see if it would get affected. But this has not been affected even kept for more than 25 days.

(b) Treated and untreated dry samples were kept in contact with mouldy Supari under moist conditions. The untreated Supari was badly affected on the 4th day, whilst the treated Supari got worse after one week. This shows the resistance of the treated Supari.

IV. Ripe unhusked Supari samples were also taken for study. 50 nuts were exposed to sulphur fumes whils 50 were not treated.

Both the samples were kept in bags for a fortnight. The colour of the husk in the untreated got darkened whilst in the treated it was of uniformally yellow colour. On removing the husk the former showed a thin film of mould, whilst the latter was quite in tact. The kernel was however sound in both the cases. The nuts inside get mouldy if not dried continuously in the sun. It is said that this quality is very susceptible to mould and cannot be preserved during the rains.

V. Bakery loaf is highly susceptible to mould as the moisture and starchy contents are favourable for its growth. One was treated with fumes and another left untreated. Both were kept under dry conditions. The untreated had mould on the 3rd day and got worse day by day. In 5 days the whole surface was covered over by mould. But the treated sample remained in good condition throughout. The experiment was discontinued after the 10th day.

Samples of different grades are being preseved to see how they would keep during the rains. Treated and untreated samples have been preserved.

SUMMARY OF TRIALS.

1. The Supari that is brought for sale to the market is many a time mouldy, owing to difficulties of continuous drying particularly during August, September and October as there are intermittent showers and the sun-shine also is not strong. Incompletely dried Supari if kept for some days also develops mould. The presence of mould reduces the price upto 40 p. c. which is a great loss to the growers.

2. Samples containing above 40 p. c. and also partially dried samples containing 20 p.c. moisture developed mould within 3 days.

3. Samples containing 40 p. c. moisture when treated with sulphur fumes for one hour, remained in good condition for 12 days and

the partially dried ones for nearly a fortnight. (Partially dried means containing 20 p. c. moisture).

4. Untreated samples containing 12 p. c. moisture developed mould after the 4th day. Whilst the treated ones remained in good condition for a fortnight after which the mould there was found as a thin film.

5. Untreated samples containing 5 p. c. to 8 p. c. moisture had a very small percentage of affected nuts. Treated samples were quite good throughout the trial.

6. When the atmosphere is surcharged with moisture, even well dried Supari gets mould ; but it takes time. Under such conditions, though treated and untreated samples showed mould on the same day i. e. on the 8th day, the former had a few patches on the surface, whilst the latter were completely spoiled. Further progress in the treated sample was very slow and the nut inside was quite sound.

7. Moisture contained in the samples had the same influence as atmospheric humidity but in this case the untreated samples showed mould on the 3rd day whilst the treated ones remained in good condition throughout for 17 days.

8. Mould is not contagious when conditions are not favourable. One of the essentials is moisture.

9. Untreated bakery loaf developed mould on the 3rd day whilst the treated remained in tact for ten days when the experiment was discontinued.

10. The colour of the samples improved on fumigation which would bring in 5 p. c. more in price.

Conclusion :—Fumigation of Supari (with Sulphur) containing required quantities of moisture to develop mould prevents the appearance of the same for a fortnight. Fumigation improves colour making samples attractive.

ABNORMALITIES OF THE COCOANUT PALM

BY

M. R. GOKARN

Agricultural Overseer Kanara

Ever since 1870 there has been a continuous stream of records of abnormalities in the Cocoanut Palm, derived from observations in almost all the tropical regions where Cocoanuts are grown. But these records have not been frequent enough, to prevent further notes being of value, and hence the following observations, made during the course of many years of observation in the North Kanara District of the Bombay Presidency are offered.

BRANCHED COCOANUT PALM.

The whole phenomenon of branching in cocoanut palms has been discussed recently by Furtado,* and has been divided by him into a number of clauses, and in many of the cases which he quotes, the branches have proved to be fertile and to yield nuts.

The first case I have noticed, and which I have had under observation since 1921, is that of a branching palm at Arge, five miles south of Karwar in North Kanara. The tree is now about thirty years old, and the branching has occurred at a point in the stem which is now thirteen and a half feet from the ground. At this point the stem has now a girth of 45 inches, and there are clustered here nine substantial branches of varying length. It may be noted that there is evidence of severe attack of rhinoceros beetles at this point, and it has been suggested that the branching may be in some way connected with irritation set up by these beteles. The possibility of this is also referred to by Furtado (*loc cet.*)

When the branches were first noticed (1921-22), the point where the branches occur was $10\frac{1}{2}$ feet above the ground and the stem had a girth, of 28 to 30 inches and a girth at the base of 54 inches. There

---

* C. X Furtodo-Branched Cocoanut Palms and their Fertility-Gardens Bulletin, Singa re Vol. III (November) 1924, p. 274

were then 9 branches of substantial size and one very small. The sizes recorded were as follows:—

Five–large branches from 42 to 48 inches long
Four–medium branches from 30 to 42 inches long
One–very small branch 3 inches long

In March 1924, the same and its branches were again measured. The height of the Palm at the point where branching occurred was 11¼ feet from the ground, and the girth was 30 inches. The girth at the base was 60 inches. There were now eleven branches, of which two were very small. The length of each branch, and the number of leaves on it at this time were as follows:—

	Length Inches	Girth Inches	No. of leaves
Branch No. 1	50	16 to 24	8
Do „ 2	48	14 to 18	8
Do „ 3	48	14 to 18	8
Do „ 4	45	14 to 16	8
Do „ 5	40	14 to 16	7
Do „ 6	18	13 to 14	7
Do „ 7	18	12	7
Do „ 8	12	15	6
Do „ 9	12	14	6
Do „ 10	...	...	4
Do „ 11	...	...	3

Similar measurements were taken in December 1926 when the height at the point of branching was 13½ feet as already stated. The length and girth, as well as the number of leaves on each branch at this time were as follows:—

	Length inches	Girth inches	No. of leaves
Branch No. 1	92	19 to 28	11
„ „ 2	62	18 to 24	7
„ „ 3	54	17 to 26	4
„ „ 4	57	18 to 20	8
„ „ 5	51	20 to 24	7
„ „ 6	24	17 to 26	8
„ „ 7	21	20 to 24	7
„ „ 8	15	20 to 28	6
„ „ 9	15	18	6
„ „ 10	3	...	4
„ „ 11	4	...	5

It will be seen that the growth of the main tree has been very slow, only three feet having been added to the height since 1921. Except for one very small branch, there has been no increase in branching since 1921, but the branches have developed very greatly, the first of these having increased in length from 60 to 92 inches and the second from 48 to 62 inches in three years. The number of leaves (fronds) is stationary and is not likely to increase, with seasonal falls as usual.

VEGETATIVE SHOOTS IN COCOANUT SPATHE.

The village of Bailur is twelve miles south of Honavar (North-Kanara) and here is an example of a Cocoanut palm which produces vegetative shoots from the opened spathe. The tree occurs in a sandy coastal garden in the midst of normal trees. The origin of the seed from which the tree has been produced cannot be traced, but the age of the palm is now from thirty to thirty five years. Its height is twenty eight feet, and the girth of the trunk varies from 48 inches at the bottom to 30 inches near the top. The crown looks somewhat like brab or palmyra palm (Borassus flobellifornies) with clusters of vegetative shoots formed in the spathe. The leaves or fronds are smaller than usual and are only 8 to 10 ft long. There are 18-20 such leaves as against 25 to 30 in good trees.

The spathe is eighteen inches long, and opens from three to four months after appearance into a vegetative growth like a broom, with shrivelled leaves. The basal portion appears like a knob 6 to 8 inches in thickness and this persists for a number of years, though it drops the vegetative shoots after six months to two years, with one or two shoots bursting from the same spathe. These knobs are the basal remnants of the vegetative shoots; and the vegetative shoots may really be *bulbils* as has been concluded by Redley* in an apparently similar case. When the 'knobs' fall the trunk looks normal, but the persisting 'knobs' can be noticed near the stem from ten feet upward from the ground level.

VERY SMALL COCOANUT FRUITS.

In the village of Dharweshar near Kumta (North Kanara) there is a cocoanut tree with an abnormality which I have not seen described elsewhere. The tree belongs to the *Kundri* variety of

---

* Redley H. N.—Branching in Palms—Annals of Botany Vol. XXI (1907) p. 415. See also Lyengar M. O. P. Note on a bulbeferous cocoanut tree from Malabar Journ. of Indian Botany Vol. III (1923) p. 289.

South Malabar, and is stated to be sixty years old. It has a thin poor trunk with a comparatively small crown and with rather narrow fronds. The spathe is short only fourteen to 16 inches in length, and five inches thick while the fruits are only of the size of unhusked betel nuts (about two inches thick). The spathe is produced each month, as in a normal tree, but the female flowers are very much larger in number than the normal. When the spathe opens in the fair season, most of the female flowers fall, but the crop is fairly certain from the spathe which appears between August and November. A very thin kernel (about one twelfth of an inch thick) is found at this time in the ripened nut. The fruits are largest at the *kambha* harvest (March—April). The branch generally develops from seventy five to one hundred and fifty nuts, almost as in the betal palm, and the weight of each fruit is from two to three *tolas* (twenty to thirty grammes)

MINOR ABNORMALITIES

Dichotomy of the Cocoanut Palm—Whether true dichotomy ever occurs in palms has been doubted (*Redley loc cet sup*) but the evidence seems to be convincing that in certain palms at any rate (*Hyphoene* and others) it is either normal or at least very common. A case which appears to be of this class in the cocoanut was noticed at Kadwad near Karwar (North Kanara). This palm was fifty five feet in height, and was normal up to the point of branching 25 ft from the ground where the girth of the trunk was 30 inches, two branches w re produced both of which fruit normally. The number of leaves on each branch varied from eighteen to twenty. The fruits are stated to have been of normal size in the early growth of the tree, but have tended to be small in the last ten years, though there has been no other difference between them and normal nuts. This tree was uprooted by storms in 1926.

Dual sprouting of seed nuts of Cocoanut—This abnormality, which, though not common, is known in every cocoanut growing country, is also found not very rarely in North Kanara. Each of the two growing shoots are known to develop into normal trees. I have not come across cases of more than two sprouts from one seed nut, though such are recorded elsewhere.

NITRATE OF SODA PRODUCES VIGOROUS PLANTS AND GIVES HIGHER YILEDS.

BY

V. K. KOGEKAR, ESQ. L. Ag.

—o:o—

The need for quick acting manures is now, day by day, being felt by those growing irrigated crops especially. Bulky manures such as Farm yard manure, Sheep dung etc. are getting scarce, and every one is now looking to the use of fertilizers.

No body could deny the utility of bulky organic manures, but under the present state of things, some supplement to these in the form of a quick acting manure has more or less become a necessity.

At present, wherever proper facilities are available, the tendency to grow irrigated crops is increasing, owing to the uncertainty of timely rains, in order to get some crop at least, and this has induced cultivators even in the remotest villages to use some fertiliser for their irrigated crops. In the Nasik district for example, the onion and garlic growers, use Nitrate of Soda for these crops. The cultivator now-a-days, uses, firstly whatever small quantity of cattle manure he can conveniently get, and then uses a top dressing of Nitrate of Soda, varying from 200 lbs to 250 lbs per acre for the above crops. This has become so to say, now his usual practice. He has found out that the above dressing pays him over and above the cost of the manure and gives him an extra profit. Thus the difficulty of getting a good crop due of the want of his usual dose of F. Y. M. is removed to a great extent. The above is simply quoted as an illustration as to how adjustments are taking place as regards the manuring question.

Similarly, the use of Nitrate of Soda for all Sorts of vegetables viz English and Indian, such as Cabbage, Knolkhol, Cauliflower, Tomatoes, and Brinjals, Chillies etc, and all sorts of cucurbitaceous vegetables is very well known. This year a very remarkable instance came under observation in this connection. A very intelligent and progressive cultivator of Hadapsar village (near Poona,) the cultivators of which place are known for their skill in growing

English vegetables as market garden crops, applied Nitrate of Soda to his vegetable crop. He used a dose of 200 lbs of Nitrate of Soda per acre to his Cabbage and Knolkhol, and got such a nice crop that his neighbour-cultivators began to wonder as to how the farmer could get such a fine crop when their crops all along suffered from the various inclemencies of weather and petty insect attacks, every now and then; while the crop manured with Nitrate of Soda belonging to the above cultivator, was very healthy in growth, developed properly and fetched a good return in the market. Nitrate of Soda applied one month after the transplanting of the seedlings, helped to give a very good stand to the crop, and it yielded well.

For all crops and young seedlings Nitrate of Soda does remarkably well and is a very easy application. Take a few pounds of the manure mix it with twice the quantity of dry fine earth, and apply the same round the plant a little away from the stem and thoroughly incorporate it with the soil round. Persons growing vegetables in small plots in their compounds are very anxious to use Nitrate of Soda and are much pleased with the effect produced.

Nitrate of Soda has produced very good results with cotton in Khandesh and the detailed results of which have appeared in the Bombay Agricultural Department Bulletin No. 143 of 1927. In these experiments Nitrate of Soda was given to cotton in combination with groundnut cake, the dose being 40 lbs of the former and 200lbs of the latter per acre.

The above facts in short reveal that Nitrate of Soda can be very profitably given to all kinds of crops both irrigated and dry (where rainfall conditions are fairly assured as in Khandesh).

Complete information about the use of Nitrate of Soda and full literature on the subject can be obtained free, from the Office of the Chilean Nitrate Committee, in Sadashive Peth, Poona City.

SINEWS AS A MANURE FOR RICE.

BY

PROF. MOSES EZEKIEL.

Two miles from Thana is a farm, about fourteen acres in area which came under my charge in March 1927. I was asked to run the same so as to make it pay. The farm consists of ten acres of rice fields with patches of uncultivated but cultivable rich rice land.

After doing the preliminary work of fencing the area with barbed wire and clearing and deepening the two wells, I grew a crop of maize on an acre of land, to test its crop growing capacity. The poverty of growth convinced me that the land was poor in Nitrogen and organic matter. In the meantime 1800 feet of bunding was completed and sufficient area to sow about four maunds of rice was ready by "Rab burning", both being done by contract. Futile efforts were made to obtain night-soil and kuchra from the Thana Municipality. Cow-dung to the extent of about ten cart loads was obtained from a dairy farmer and used for "Rab-burning". More could not be had. The first rain came on the 3rd of June and on tha 7th more heavy rain fell. I was therefore compelled to broad-cast about four maunds of seed in the "Rabbed" area. How the remaining eight maunds of rice seed still in hand was to be sown, remained a problem. There is a bone mill about ten minutes walk from the farm, and so I thought of a new plan of obtaining the seedlings for transplantation. Every day for six days a maund of seed was put for germination in large tubs. On the day the germinated seed was broad-cast, the seed-bed was thoroughly ploughed and cross ploughed and all weeds completely removed. Two maunds of sinews for every maund-measure of seed sown, were first broad-cast and thoroughly incorporated with the soil by ploughing and cross-ploughing. The germinated seed was then broad cast. The sinews decomposed quickly and the seedlings on the manured beds came up even more vigorously than those on the "Rabbed" beds. About 50 inches of rain was recorded at the Civil Hospital Thana by the 10th of July when we began transplanting. Every plot that had received no manure was given the same at the rate of two maunds (56lbs) of sinews for every maund-measure of seed

transplanted. Owing to a local prejudice against all products of the bone-mills, the hauling and spreading of manure in the fields had to be got done by Chamars and other untouchables. The transplanting was completed on the 23rd of July and cost Rs. 225/-. The results were extremely gratifying.

1. The seedlings in the seed-beds came up more vigorously than those on the "Rabbed" beds.
2. The growth of the transplanted seedlings was better than that on the best plots in the neighbourhood.
3. The colour was a healthy dark green and indicated pros 1—1 pects of a heavy crop.
4. The tillering was not so plentiful. The vertical growth seemed to have taken place at the expense of tillering.
5. The actual outturn was ten Khandis in an area of ten acres, which looking to the absence of any other soil treatment (for want of time) is extremely hopeful.

The results lead us to the following tentative conclusions:-

1. Sinews can take the place of Rab in rice seed-beds.
2. They can be used as a general manure for rice in plots where the rice is transplanted.
3. They decompose quickly and give a vigorous start to the seedlings.
4. Thorough weeding by means of ploughs and other implements or "ploughing in" of the weeds is absolutely essential for the success of this method of preparing Seed-beds.
5. They are cheaper than Rab burning or fish manure (kutta).
6. They exert a very favourable influence on the subsequent crop.
7. Almost unlimited quantities of sinews are available all along the G. I. P. line, and so may be used more extensively for manuring the land generally.
8. There is a local prejudice against the handling of them, but where the untouchables do the handling and spreading cheaply, they may be safely recommended as a universal manure for supplying organic Nitrogen to the soil.

9. Sinews do not require to be powdered or made finer then what they are, as sold by the bone mills, and the operation of incorporating them with the soil is cheap and easy, and can be done by women and boys.

COST OF OPERATIONS.

Seed, ten maund-measures † Rs 4/-per maund ...	Rs	40-(-0
Sowing and ploughing	„	20-0-0
Transplanting	„	225-0-0
Weeding	„	30-0-0
Harvesting	„	60-8-0
MANURE:		
40 Maunds of Sinews ‡ 1/9/-per maund ...	„	62-8-0
	Rs.	438-0-0.

OUTTURN:

200 Maund-measures of Rice ‡ 3/8/-each –	Rs.	700-0-0
6000 lbs. Rice straw ‡ 16/-per 1000 lbs.	„	96-0-0
	Rs.	796-0-0

PROFIT:

For ten acres of Rice land ... 362/-.

This works out to Rs. 36/-per acre.

NOTE: One Bombay maund-weight is 28 lbs., whereas one Maund-measure of unhusked rice weighs from 62 to 61 lbs.

The Rice crop was followed by Wal (Dolichos lablab) and the author understands that the owners got a good outturn. As, however, he severed his connection with them, the exact figures of outturn are not available.

The sinews were very kindly analysed for the author by the Agricultural Chemist to the Government of Bombay, Poona, and found to contain 12. 4 % of Nitrogen.

THE USE OF *REETHA* (SAPINDUS TRIFOLIATUS) AGAINST THE COMMON APHIS

By

S. S. BHAT. M. Ag.

———():o:()———

The soap-nut, or *Reetha* in Marathi and *Attala Kai* in Kanarese is a well known product of a tree of the same name. The fruit is essentially *the soap* of the cultivator and is stored in almost every household for its use as such. It is highly cleansing and antiseptic and is specially a very useful material for our Indian ladies.

The fruit is plucked when fully ripe and stored after properly drying. The dried fruit, when immersed in water and rubbed by the hands, produces lather freely and gives a thin dirty coloured solution. This solution was used in spraying against aphis on some experimental Santra plants with very good effect.

The dried fruit was broken. Its seed was removed. The bark was kept immersed in ordinary cold water for about ten minutes. It was then rubbed vigourously between the palms to produce forth and to prepare the solution of whatever material in it was soluble. When the fibrous portion would give no more lather, it was taken out of the water and thrown away. The solution was then seived twice through a double-fold of a fairly thick cloth. The ordinary *Manjar pat* cloth was found quite good for this purpose. The liquid thus obtained was clear and brownish dirty in colour. This was sprayed on the branches affected by aphis with a hand syringe.

In a day after the spraying, most of the insects were found dead. A second spraying after an interval of two days was quite effective in completely exterminating them. The solution of soap-nut was used with very good results on plants in the field also. When care is taken to sieve it well, so as to allow no particle of suspending material in it, the solution can be used without danger of choking in a knapsack sprayer. The solution is fairly sticky and no other material like soft soap need be used with it. It leaves no mark on the branches and leaves of the plants. Even very young tender parts are quite secure when this solution is used.

About a quarter of a pound of whole dried fruits is found enough for making about four gallons of solution.

CHLORINE MIXTURE AND ITS USE IN TYPHOID AFFECTIONS IN DOMESTIC ANIMALS.

By

Dr. B. B. JOSHI, G. B. V. C.

(*Lecturer in vety. Science, Agri. College Poona.*)

———:o:———

The easiest, the cheapest and the simplest method to prepare Chlorine Mixture is as follows :—

R/

Pot. Chlorate	—Half a drachm.
Acid Hydrochloric	—one drachm
Aqua	—12 ounces.

M. ft. Mist.

Sig. To be prepared fresh, half an ounce for dogs and a tea spoon for fowls every four hours.

The most common Typhoid affections in veterinary practice are Typhoid in dogs and poultry. Many valuable dogs and poultry die every year of this malady and in veterinary literature there has been nothing so far substantial in the way of cure, mentioned. In my practice I have had many such cases and tried all sorts of cures but to no good. After all, lately I tried this Chlorine Mixture and found it very effective. I think, if I mistake not, I have been able to cure almost all cases that were brought to me for treatment. It is not my intention here to describe what Typhoid is like and how to detect it in dogs and poultry as every Veterinarian must have had many such cases in his pratice to deal with. I want to know the results of such a treatment if any one has done so. If not, I would certainly like the general profession to give this treatment a thorough trial, and to let me know their experience about it, in such cases.

It must be mentioned here, however, that Typhoid in poultry is generally mistaken for Cholera and Spirochaitosis as I used to, some years ago. As such it would not be out of place to mention the few facts in this article about the malady.

Fowl Typhoid is knwon as Fowl pest. Chickens and Turkeys, Pheasants and Geese generally suffer from the malady. Natural infection is probably transmitted mostly by droppings add the nasal secretions of the affected birds. The disease commences with depression and diminishes appetite, which condition soon changes to conspicuous dullness and sleepiness. In the mean time the comb and wattles become dark-red and finally are blackish red in colour. On pressure of the bill, a tenacious mucus oozes from the opening. Profuse diarrhoea is observed and the droppings are dirty, greenish, fluid, and towards the end of the disease' the writer has observed in several cases irregularity in walk and symptoms of paralysis. The disease runs a course with the exception of very rapidly terminating cases of 2 to 4 days. With chlorine treatment as prescribed recovery takes place within a day or two.

In dog Typhus, the symptoms almost invariably commence with sudden vomiting which usually attacks the animal, while eating or drinking, and which does reappear very frequently. The vomited material consists of remains of the infested food or water stained yellow by the bile. From this stage on, the animals refuse to eat. On the other hand they drink water very frequently and feverishly. There is first constipation but later diarrhoea appears. The animals become greatly emaciated as a result of the frequent vomiting and persistent inappetence and the disease develops in its characteristic form in from 3 to 5 days. The abdomen is very sensitive over the region of the stomach and it is either bloated or drawn up. In average cases the disease runs its course from 4 to 6 days.

I have described the malady as it occurs in dogs and poultry giving only such symptoms that I have been always accustomed to catch at as the most typical and diagnostic of the malady.

The diet I prescribe in such cases is icy cold milk only, withholding water all along the course of the disease. If this cannot be done, let the patient have chlorinated water by its side so that it may avail itself at its ease.

The main point of chlorine mixture in this malady is the disinfection of the alimentary canal through and through and thus preventing auto-intoxication with the poison of the disease.

HINTS FOR CONDUCTING COMPAIGNS AGAINST WINGLESS GRASS-HOPPERS ON JOWAR AND BAJRI CROPS.

BY

S. S. SALIMATH ESQ B. Ag.

Deputy Director of Agriculture, Southern Division.

———():o:()———

The attack of wingless grass-hoppers (Colemania Sp.) on Jowar and Bajri crops has considerably increased during the recent years and the cultivator is losing very heavily on this account.

The Agricultural Department in the Southern Division made some useful observations last year on different methods of combating the attack, mainly on bagging and dragging tin sheets. Comparative trials indicated that dragging tin-sheets is more effective than bagging during the first 5 weeks of the life of Jowar crop. Later, tin-sheets could not be used but bags could be used for a month more, without any damage to the crop. It was also observed that 3 operations of dragging tin sheets followed by 2 or 3 operations of bagging would bring the attack under control, at a total cost of about Rs. 2-8-0 per acre. For sucessful work, however, Cooperative Organisation is what is absolutely needed, or else hoppers from the neighburing fields get into the area operated and vitiate the work done. Stray individual efforts, therefore, are not successful, except in isolated small fields.

The following are a few suggestions for organising and conducting campaigns against this pest :—

(1) One village or a complete block should be taken as a unit of area to be operated and the cultivators concerned should be induced to cooperate or organise compaigns.

(2) The size of each campaign should better be limitted to 20 workers with 10 tin-sheets. At the rate of 30 acres per day this batch ought to be able to operate 300 acres block, 3 times during the first 5 weeks of the life of Jowar crop. This very batch may continue to have 2 bagging operations over this area within the next three weeks. With organised work, I feel that 3 operations of dragging tin-sheets and 2 of bagging will be sufficient and that the cost should not go more than Rs. 2/- per acre.

(3) Boys are found to do better work than men either for dragging tin sheets or for bagging and they may be employed where possible with advantage. The cost of these operations with boys will be less than that with men.

(4) All cultivators concerned should be induced, each, to pay Rs. 2 per acre in advance or one man to work 5 days per acre of the Jowar area that he owns.

(5) Campaigns should be started as soon as the pest appears. Delay will mean less chance for dragging tin-sheets and more cost for bagging.

(6) Tin-sheets should better be 8′ × 2½′. We worked with 6′ × 2′ and 12′ × 2′ tin-sheets last year. 2′ width seems to be too small as some hoppers in the later stage, jump over this width and escape, 12′ length seems to be rather unwieldy. The shape of the tin-sheet should be like that of an iron Scraper. The upper surface of the tin-sheet should be smeared with tar from time to time as required. The tar traps the hoppers as they jump on to it and should not be allowed to dry.

(7) Bags should better be 6′ × 6′ × 2′ and should be drawn swiftly as described by Dr. Colemam, in his Bulletin No. 2 of 1911, Entomological Series. In grass-hoppers-campaigns on Rice crop at Belgaum, it is found that holding the bags at one corner of the rice bed against the wind and driving the hoppers into them along the wind, is decidedly more advantageous than dragging the bags. This may be tried on jowar too. The same 20 men should move in a semi-circle, 5′ apart and go on sweeping the hoppers along the wind and cornering them into a bag at suitable distances. The hoppers thus caught should be buried in deep pits.

A few cultivators maintain that late rains in November have acted as check and that the pest may not appear during the coming season. These rains have no doubt destroyed many adult insects, but some of them had already laid their eggs and some which survived after these rains continued to lay their eggs. The general apprehension, therefore, is the probability of a serious pest of grass-hoppers on Jowar crop during the next season and it is only reasonable that we should be ready to combat, if it appears in any place. The eggs of Jowar grass-hoppers generally begin to hatch in July and it is time now to organise the required campaigns.

DATES IN SIND

BY

HOTECHAND G. M. & ALI MAHOMED ULVI B. Ag.

Date growing on commercial scale has been practised in Sind from time immemorial and probably from the time of the Arab conquest of Sind. The chief centres, where high grade dates are found, are parts of Upper Sind and especially on both the banks of the river Indus at Sukkur in a stretch of 12 miles in length and one mile in breadth, going as far as Khairpur Mirs on the left bank and Abdu and Bechanji on the right.

Kotri also boasts of good dates, as during the date season a railway traveller passing through the Kotri station can not but be struck with the sight of heaps of oblong envelops like bags of date leaves filled with the fruit being hawked on the railway platform with the well known cry of "pind Kotri ji mitta halela"; but unfortunately Kotri dates have lost that reputation, being much neglected at present. They can hardly compete with those of Rohri. We also find groves of date palms in the suburbs of Karachi, but the fruit is very inferior. This is due to the fact that toddy is being extracted from these trees and consequently the fruit must deteriorate. When once toddy has been taken from a tree, it does not bear fruit for three to four years to come.

Clusters of date trees are also found in some of the Karachi creeks, such as Jhimpir, Pir Patho and Ghulamallah, where also toddy is mostly extracted.

Last year dates of Rohri had suffered to a large extent from a kind of disease never known to the growers before. They called it "Jarro" a kind of cob web of minute threads round the fruit in the bunches. This web was observed when the fruit was as big as an ordinary berry. It was seen that the dust blown during the 40 Dog days of May–June was cought in the web and had more or less suffocated the fruit, which in consequence was either checked in growth or had withered and dropped one by one. To enquire the extent of damage done by this peculiar disease and to suggest certain preventive measures it was essential to visit the tract.

Kazi Alimahomed, pensioner and Jagirdar of Rohri is a progressive Zamindar and unlike others of his class takes keen interest in his garden. He has always been cooperating with the men of the Agricultural Department. Thus he has been able to successfully effect several improvements on his plantation. It is here that people like Sir Chunilal Mehta, the Honourable Mr. Dehlvi (late Minister for Agriculture), Dr. Harold H. Mann (late Director of Agriculture) and Mr. T. F. Main the present Head of the Bombay Agricultual Department have never omitted to include the visit in their programme. Here, one can see what can be done by those, who have the will to do what they realise to be the best in following the advice of their friends in the Agricultural Department.

His plantation is just on the river bank and is fed by a small oil engine put up for irrigating his garden. This orchard has a history to tell. The ancestors of the worthy Kazi had got it as a Jagir from the Moghul Emperors for good services rendered to the crown, and the Sanad, with an autograph signature of the Emperor Mahomedshah is jealously preserved as a heir-loom in the family. The area of the garden is not very large, hardly, 2! acres, but by judicial management it leaves the kazi a good margin of profit and thus he maintains himself in position. The date trees, some of which are as old as 200 years or even more, have not failed to maintain their good yield and quality of the fruit. His best and precious trees are the Lohar and Asuli, and those next in order of importance are Edalshahi, Rukan, Surmet, Tottar, Khar and Noori.

The young Kazi, the son of the old man, was on the spot and it was quite clear that he was taking personal interest in the management and appeared very enthusiastic about the work. Mahomedan zamindars as a rule are rather indolent and generally leave the burden of their estate management to their 'Kamdars'. But this was not the case here; both father and son believed in personal supervision of the work and thus have been able to put the plantation on a sounder basis and high reputation and which now serves as an object lesson to the neighbourers.

Our visit took place in the first week of April when the artificial pollination had just been completed. This is essential in date growing, as otherwise fruit will not fully develop. The pollination season lasts some five weeks from 20th February to 30th of March. For this purpose spathes, containing the inflorescence are collected from the male tree and short spadices, containing ripe pollen are

inserted between those of the female tree which thus gets fertilised. A female palm may bear over a dozen of flowering spathes. As soon. as a spathe is ripe enough, it is pollinated. So during the pollination period a man has to climb each female palm several times in the week, to watch each spathe carefully for the purpose.

After the fruiting season is over, it is desirable to prune the female tree only, the male being left alone. It is believed that the male palm left unpruned becomes more potent and produces a big yield of strong and larger spathes for fertilising the female flowers. Each date plantation should have one male for each 25 female trees for the purpose of pollination. During the pollination season male spathes are sold at a good price and are even imported from a distance.

Date fruit is marketted under different local names. Some varieties are artificially cured, others ripen on the trees. Some varieties are suitable for drying such as Edalshahi and could be preserved and kept all the year round, while some have to be sold when only half ripe.

Economically date is a very good tree. There is not a part of it, that is not used in one way or the other. The fronds furnish a regular village industry, such as the preparation of mats, baskets, fans, ropes for water lifts etc. From the coir, ropes and coir matting is made. When the tree has become too old to bear any fruit, the trunk is cut to serve the purpose of a girder in a building. It is also used as a water channel called 'nesar.' After the fruit has been plucked, the fruit branches provide material for making very good cages for patridges. In addition, good strong and durable baskets of all kinds are made from these.

Date cultivation at Rohri affords an example of Hindu Mahomedan cooperation. The date gardeners are generally the Mahomedans but the latter find it necessary to call in the Hindu contractor or Bania to assist them. When visiting a date garden this Bania would always be seen busy in making one kind of an article or another from the fronds. This home industry provides work for all his home people in the spare time, and thus adds something to his income. This is one of the reasons that make the Bania stick to the date contracts.

The enquiry about the disease showed that about four anna damage had been done by the new disease "Jarro" in the year 1927. The good Kazi agreed to carry out our suggestions to control this trouble, should it make its appearance again this season. A spray-

ing pump has been supplied to him for spraying a solution on the bunches when the disease appears. The results of this experiment will be carefully watched and if the measures succeed they will be generally advocated in the date growing tract.

While returning a visit was paid to Wadero Baghai's garden on the way. This Wadero had been supplied with very good Iraq date suckers in 1907 free of cost by Government on very favourable terms. He was given a piece of land, free of assessment, to grow these on, but the Wadero did not pay much attention to the suckers. They were allowed to grow unwatered and uncared for. Having received them free he did not realise the worth of these, and for this mistake his descendants are sincerely repenting. Due to this neglect some suckers died; others were stolen or purposely cut away as useless. Now there remain only two trees and they are the pride of the whole tract. They are now strongly guarded and no body is allowed to go near them or even shown. But of what avail are these precautions now ? Due to injuries at the base the trees have stopped growing suckers and hence the species has not been multiplied. It is rather unusual for a date tree to stop throwing up suckers at this age, but as these two trees had been neglected and possibly the growing bud at the bottom must have been seriously injured by a stealing thief, they have become barren.

The Agricultural Department has since then, obtained several lots of good date suckers and these have been planted on Government Farms at Landhi, Mirpurkhas and Larkana. Only in March last a large consignment of about 300 suckers of very good varieties has been obtained through the Iraq Department of Agriculture and planted at the Sukkur Farm. It is now hoped that indents of Zamindars for good suckers will be met with in the course of a few years.

VANASPATI JEEVAN (PLANT-LIFE).

(A REVIEW)

Mr. V. N. Gokhale B. Ag., B. Sc. of the Poona Agricultural College has written a book on the above subject in Marathi. It consists of over 200 pages containing 54 lessons dealing with the different aspects of plant-life. It is a book on Botany but it is not written in the usual dry and lifeless style. The author has put life in it and appropriately calls the book 'Vanaspati Jeevan' or 'Plant-life.'

It is written in a simple language with the scientific words properly translated and the English equivalents for the scientific words are given to avoid confusion if any is likely to be produced. The whole style of the writing is such that any one-even a layman-who takes up the book would not leave it without completing it. The book is profusely illustrated with diagrams which are very attractive. The examples taken are all of familiar type.

The book deals with almost all the sections of Botany and as such is useful to all those who want to study Botany through the medium of Marathi. Even to the college students who usually read English books the reading of this book will be very valuable as the book is much better than many of the Elementary books on Botany in use The book has been well spoken of by Dr. W. Burns, Economic Botanist to Govt. of Bombay and Prof. S. L. Ajrekar, who is the best authority on Botany in the Bombay Educational Department.

The book is an excellent addition to the scientific literature in Marathi and we congratulate the author on the masterly way in which he has treated the subject. The price of the book is Rs. 1-4-0.

D. L. S.

AN EVER BEARING MANGO.

By

(R. B. DESHPANDE, Ag., RESEARCH INSTITUTE PUSA.)

The general flowering of the Mango in India is from January to March and fruiting from May to August though there are varieties that flower and fruit in different seasons. The Mango belongs to that class of fruit-crops which bears only once a year.

A very interesting case, contradictory to the above facts, was observed on the 17th June 1928, in a Mango orchard near Pusa (Bihar). It was a fair sized Mango tree, seen bearing inflorescence, and fruits of varying sizes-when the adjacent early types had already been harvested and the late once were almost ready for harvest. It was indeed a novel sight. On inquiring if the abnormality was due to any causes during this particular season, I was told that the tree was ever bearing.

It is my intention to submit photographs and information on some other points of this case in some subsequent issue of the Agricultural College Magazine.

Dr. W. Burns has made a mention about a twelve-month or *Barmashi* mango in Bull. No. 103 of 1920 of Bombay Department of Agriculture. Eds.

BREEDING OF BEGONIAS BY SELECTION IN SEEDLINGS

BY

MR. C. G. PARADKAR

Non-graduate Assistant, G. B. Gardens, Kirkee.

—(·)—

Plant breeding by selection in seedlings is an easy work, which layman can take up, when compared with plant breeding by crossing, in which some technical knowledge is necessary. Lately breeding work by crossing is being carried on by the Agricultural Department in the case of cereals and cottons &c. for desirable type.

Since Sirdar Dr. Cheema took charge of Horticultural Section, Breeding by selection in seedlings is being pushed up in case of fruits-such as Grape, Guava, Pomegranate &c.

Taking into consideration the advantages of getting new plants by breeding by selection in seedlings, I thought of Breeding ornamental plants, such as Dracáenas, Impatiens, Begonias &c which I am required to look after while working in G. B. Gardens.

In the present small article, I give some information on Breeding of Begonias by s lection in seedlings, which may interest those who take fancy in ornamental gardening.

Begonias are members of the natural order Begoniaceae. These plants of different groups are useful for borders, carpe tbeds, rockeries conservatories, windows, table and verandah decoration. These plants are more or less sappy or succulent herbs having stems in some cases reduced to rhizomes, in others, to small tubers and in some others to clean stems. Some are annuals while others are perennials. In the Bombay Presidency these plants can be seen growing in a wild state on rocks or branches covered with moss under partial shade at Kanakeshvar, Khandala, and Amboli. Under domestication, they may turn out useful plants for carpet and rock gardening. In most of the gardens, of the Bombay Presidency only the following three groups of Begonias are seen under cultivation. (I) Begonia Socotrana (II) Semberflorens (III) Rex. In rare cases, wealthy amateurs grow Begonias of tuberous type. The tubers are imported from Europe and cost about a rupee and annas

four per tuber. The tuber in our climate is of no use after it has once flowered. These tuberous begonias however bear the most beautiful and large flowers of different shapes and colour during monsoon and early part of winter. The Breeding of these useful Begonias on commercial scale is possible at Kashmir and other hilly stations of Himalayas, where, if grown, they can be offered to the traders at far cheaper rate per tuber than at present.

In the gardens of the Bombay Presidency, Socotrana, semperflorens and rex groups are mostly grown indoors; though in the tract of light monsoon, with elevation, all these types can be grown out doors in raised borders, carpet beds, and rockeries during monsoon, when dwarf annuals, with flowers for a long time, for outside decoration, are a great demand of the gardeners.

Such is the importance of the plants belonging to this order of Begoniacea and therefore it is worth while, taking its breeding in hand by the gardeners of our country, who have got more natural facilities in dealing with these plants than European gardeners who have to grow them under glass with artificial heat under adverse circumstances.

The eeds of Begonia are very minute, like fern spores. The stratum and the aspect on which the seeds naturally germinate in our Presidency is pretty nearly the same as ferns "Adiantum." One can find the small Begonia seedlings growing and flowering in September along with Adiantum covdatum under partly protected patches of small mounds by the side of a water course above the mountains in nature, or on old bricks or stone walls of deserted buildings.

Taking into consideration these observations, the Begonia seeds of rex and Semperflorens were sown on freshrs baked bricks. A furrow about one fourth of an inch in depth, one and a half inch in width and three inches in length was carved on the flat surface of the brick. This furrow was filled in by the following compost slightly made moist :—

Fine brick dust, Fine sand, moss dust fine powder of leaf mould in equal proportion.

On the surface of this soil the seeds were sown on 5-9-1927. After sowing a fine dust of moss was lightly sprinkled. The brick was placed in a big pot, the mouth of the pot was covered over by a pane of glass. The pot was put in a place which was shaded by a tree of Caesalpinia ferrea. After sowing, the brick was made

thoroughly moist by giving fine sprays of water by a hand syringe, after that, the brick was given spraying twice a day.

The seeds germinated on 23-9-1927. On 20-1-1928 they were thinned out in the manner of the fern seedlings on the flat surface of a brick in furrows containing the same sort of compost. On 28-4-1928 they were potted in small thimble pots. In potting a compost containing fine sand, sandy, red river-soil and fine leaf mould in equal parts was used.

Some seedlings of Begonia Semperflorens (or as they are called by gardeners as Fibrous rooted Begonias) flowered on 21st May 1928 and it was found that some plants differed in the colour of flowers of the parent plant and thus we got a new variety in this type.

In the Rex type we find some seedlings differing from parent in colour of leaves for which they are grown.

For decoration purposes, we must get plants having different colours of leaves and flowers and this aim can be easily achieved by the ordinary gardeners if they want to take their share in the advancement and trade of decorative gardening for whose information this small article is written.

It is needless to point out that, the tuberous Begonias, which fetch a high price per tuber in the market, can be raised by seeds on hilly tracts of Himalaya in the same manner as described above.

Last but not the least thing to point out is that good many clever workers will come out in the course of time from Agricultural Colleges who will like to have outlets for their energies. Begonia-growing on commercial scale will enable them to take their share of profit in the European markets along with Holland (the tuber growers of the world).

OPENING ADDRESS

BY

RAO BAHADUR P. C. PATIL, L. Ag. M. Sc., Ag., PRINCIPAL.

Colleagues and students.

I heartily welcome our old students and congratulate those who passed their I. Ag. and Jr. B. Ag., last March. Those of you who could not get through examinations need not feel for their failure. The experience and the knowledge that they have earned will stand in good stead not only in next March alone, but throughout their life time. It is not to console such students that I say this. I sincerely think so. I give you personal observation. Before long. I was on study leave in the U. S. A. in the Wisconsin University. While I was preparing for my M. Sc., I had employed a bright young man from my own class as a coach. This friend of mine though much better prepared would not appear for exmination with me. On being asked the reason, he told me that he was in the graduate school not for M. Sc. degree, but for solid experience, knowledge and University life. I took my degree in 19.2 while my coach took the same in 1923. I therefore sincerely believe that your longer stay here ought not to discourage you, provided you have devoted yourselves to your students. I hope you will note the proviso.

I welcome and congratulate the new-comers upon their selection of this College. To my mind, no nation which wants to live and progress can neglect raising food and clothing, as also the defence of the country; and as such it is the duty of every young man to give closer attention to Agricultural and Military profession. Ours is an old country; We are crowded and conjested in a limited area of good land, and unless we produce more food and clothing from the same area we can not expect to live well and as such every effort to grow two blades where one grew before, must be encouraged. If each of you contribute a little towards the improvement of Indian Agriculture, the country will get considerable relief.

Apart from this national view point, I may tell you that Agriculture and country life are conducive to better physique, better intelligence and longer life, not only to individuals but also to their posterity. It is the country side that feeds cities with vigorous

blood and intelligence. Ranade, Telang, Agarkar and Gokhale and also the eminent workers of the present time, like Karve and Paranjpye were not born in Poona or Bombay but in small villages remote in the country side. Very few intelligent families in the City maintain vigour more than a few generations. You may argue that our country-side is dull and uninteresting for educated men and women. Young men, it is for us to change the aspect of the country side and make it brighter; and those, of you who will take up to farming and those who may be entrusted with Government duties in Agricultural Department, will have a very vergin field to show their abilities and to serve the country.

Students, the notion-that Agricultural course is easy, is dispelled. I quite see this from the past results of the fresh students, seeking admission to this College. Agricultural course though very useful and interesting is not easy. Please remember this. We went to keep up our position in the Universities of the world. We want to maintain our first position amongst the Agricultural Colleges of the country. We are proud that we are able to do this and that is why admissicn to this College is sought eagerly by students from Bengal, U. P., Madras, Ceylon and far off provinces and states. It is unfortunate that we have to restrict the total admission as also the admission to students from outside Bombay Presidency. We have submitted a scheme of extending the college and Government have kindly agreed to take the work of extension in hand, before long.

I do not know, if I will have the chance if being here by that time, but many of my younger friends will certainly have the opportunity of welcoming a larger number of students, from all over the country. It will be a happy day indeed.

Students, I may ask you to devote closer attention to your work both in the class and in the fields. It is observed that many students grudge expenditure on text books. It is a bad economy. Standard books are written by able and experienced authors; and they are useful both for preparation as also for reference purposes in after life. The Professors treat their subjects independent of texts and try to bring their experience to bear on their subjects. Never grudge expense on standard books. I can point out to you a few items where you can and should economise.

Most of the staff will bear me out, if I say, that students, at any rate in this part of the country, spend out of proportion on boarding,

conveyance, theaters and cinemas. Most of the parents find it hard to maintain their sons and daughters in colleges on this account and I would suggest economy in the items mentioned. You have excellent quarters in open and airy suburbs. You have good Gymkhana with splendid traditions. I believe you, have a good set of Professors and Lecturers and, I hope, we will make a happy family if you take my advice in the light in which it is offered. Many of us are old boys of this college and we have tried to build an, "Agricultural College Spirit." New-Comers, enter into the "Agricultural spirit" and I am sure, you will not have to repent for making your choice of the College.

I have finished. I have to make an announcement that after I close, the Head Clerk will take the roll call of newcomers. After he finishes, the Hostel Superintendent will distribute rooms. We will have no lectures today. Those of the newcomers, who may like to see me, are welcome to do so between 2-30 and 3-30 p. m. today in my office.

Gentlemen, I thank you.

THE WILD RICE (ORYZA SATIVA) OF THE BOMBAY PRESIDENCY.

BY

S. G. BHALERAO, ESQ. B. AG.

Crop Botanist to Government of Bombay, Poona.

The cultivated varieties of rice are, no doubt, full of interest; but even the wild type of rice seems to have some interest in it, for those what can be expected to look at it from partly agricultural and partly botanical point of view. A small endeavour is, therefore, made here to set out the important feature of it.

The type occurs abundantly on the Western Ghats and occupies the zone where the rainfall is over 30 to 35 inches. As an annual

aquatic, it occurs in marshy areas, in small pools and ponds and on the margins of the big tanks. It is rarely found in more than 3 feet depth of water and on land without any standing water as well.

The life history can be briefly given as under : –

The seeds germinate soon after the 1st showers, in May or June; and the plant-growth is favoured by the showers of rain that follow. The growth, in the form of continuous tillering, may continue as long as water is available till the end of December, or even latter. Flowering, however, begins by the end of September and is in full swing in October. For the rest of it, it goes on along with the fresh tiller-formation. From flowering, the seed matures in about three weeks, and as soon it is some-what ripe, it drops down of its own accord. As it drops, it is buried in the mud below, where it remains dormant, till the next year's monsoon showers, when it germinates and starts on the course of life again.

The description of the wild rice plant is interesting and is attempted here below in terms which are intended to show it in comparison with the common types under cultivation in general.

The seedlings are highly adaptable to either the conditions of drought or water-logging, that may prevail, soon after germination. When a period of drought follows the germination, they remain stuck up to the ground as highly dwarfened structures. If, however, it is a period of heavy rain-fall, leading to accumulation of water, then they grow very tall and are observed to make efforts to hold their heads above the rising tide of water. They have a copious tillering habit and the tillers spread almost parallel to the soil surface, in the initial stage. In height, the plants may be called dwarf and are not seen more than about 3 feet above the water-surface, although while growing in depths of water, already referred to, they may have a large submerged portion of stem. The foliage is rather coarse and hence is not eaten by cattle. While nearing the flowering, the stems grow up more or less erect. The panicle is a small one, varying in length from 4 to 7 inches. The panicle branches do not generally exceed 8–10 in number and they open out very widely from the central axis. As soon as the flower opens, the two stigmatic branches which are very long and highly or coarsely hairy, bend out of the glumes, remaining there permanently even though the glumes usually close an hour or so, after they have opened. Hence chances of cross pollination in the type seem sufficiently numerous. The flowering glume has a very long awn reaching at

times up to 4 to 5 inches. The awns are very rough to feel on account of a number of closely set serrations on them. The maturity of the panicle is uneven, and while some grains are yet in milk, others at the top of the panicle, have their full development and do even drop down. The number of grains in the panicle is about 100 and the proportion of the weight of grain to straw is about 1 : 3. The husk of the grains is brown or black in colour, while the kernel is dull red when fully ripe. The seeds seem to require a long period of rest before they can germinate, even when the external conditions required for germination be available. The straw when dry is eaten to some extent by the cattle.

Probably because of the liberal chances of cross pollination, the wild rice-type has several distinct sub types in it. In several places in the Kolaba District, the grain seems to be distinctly coarse and ashy-brown in colour. In Ratnagiri it was observed to have a small grain which had the characteristic rustly brown colour in the flowers on the glumes quite at flowering. In the Belgaum and Dharwar Districts of the Mallad tract, where the type was studied in detail, a number of sub-types did appear, of which the following may be mentioned as the chief :—

I. The inner glumes, black brown, when ripe.

A. Tips of inner glumes, red. red.

(a) Deep red awns... ... ... 1.
(b) Faint red awns... ... ... 2.
(c) Awns red at their tip. ... ... 3.
(d) White awns. ... ... 4.

B. Tips of inner glumes, white.

(a) White awns ... ... 5.

II. The inner glumes ashy brown, when ripe.

A. Tips of inner glumes, red.

(a) Deep red awns... ... ... 6.
(b) Faint red awns... ... ... 7.
(c) White awns ... ... 8.

In addition, several other variations were noticed, such as for instance :—

1 The presence of yellow, or red, or brown colour, in the furrows, on the glumes, before flowering.

2 The presence or absence of a dark coloured band at the node.

3 The presence of coloured auricles, which is a rarity.

The economic significance of the wild rice in general is partly benefecial but mostly injurious. It is benefecial in so far as it is a sort of food grain of value to man at a time when the proper crop is not yet mature. During the days of ripening of the seed of the wild rice, people can be seen going round in tanks, with baskets of convenient size in hand, for collecting the grain of it, which they can easily do by shaking the masses of the panicles, in the baskets, that they carry. The grain is then fried in a pan, on the fire, to enable partly the drying of it and partly the removal of the husk of it after pounding. As a product of pure nature it has a special value as a religiously permitted article of foodstuff on days of fasting among the Hindus. It is also supposed to have some medical value, and is prescribed as an article of diet during the coarse of treatment of certain diseases and specially during the convalescence. But the injurious influence of this type of rice more than counterbalances the few points of merit mentioned in favour of it. The injury is due to its presence as a weed in the rice crop. As a matter of course the wet conditions, prevailing in a rice-field, are very favourable for the growth of general vegetative life. Over and above the almost total similarity of the wild rice with the cultivated rices makes it hard for detection, and there are forms which can not be differentiated, till the last stage, of the panicle-development, when all the grains of the panicle shed down in the field below, and are lost. The vigorous habit of the growth of the plant and its hardy constitution, put in the position of a very successful competitor with the proper rice crop, and if the destruction of this weed in the cultivator's field is neglected, say for about 5 years continuously, then it so thoroughly establishes itself as to more or less completely swamp out the proper crop-plants. To make the mischied complete the wild rice, on account of its structural suitability, freely enters into cross-polliination with the cultivated varieties, and thus introduces the habit of shedding in them. As the result of such crossing and consequent shuffling of characters, every variety in the Mallad tract, in the Southern Division of the Bombay Presidency, has its own grain shedding types, resembling the variety for a number of characters. Such types are generally termed the 'Gonag', and the Gonag is a standing menace to every cultivator in Mallad.

This practically reduces the wild-rice to the position of a very objectionable weed, present in almost all the irrigation tanks, in Mallad, and it passes down in the neighbouring cultivated field along with the irrrigation water and in a number of other ways. It is therefore a serious problem in that tract, and taxes the energies of the cultivators to an enormous extent. In fact the sooner the weed is under effective control, the better.

The methods of control that can be advocated at present are more or less the following :—

(1) If possible the sides of the irrigation tanks should be either pitched with stones or deepened to have more than 3 feet of water so that the wild rice would not grow there as easily as it does now.

(2) From tanks, the wild rice should be killed by sweeping with brush-wood, when, in about the month of June, it is very tender, and later on, by cutting close to the ground before flowering.

(3) The existing wild-rice plants and its cross-progeny should be removed from the field and should not be allowed to lie carelessly on bunds, as it is now done, but should be completely destoryed by burning.

(4) The complete removal of the weed would be facilitated by growing very distinctly different crops like Nagli (Eleusine coracana) on high lying lands and sugar-can on the low lying lands for a year or so after every 4 or 5 years.

(5) Wherever the circumstancss would permit, it would be advisable occasionally to try to grow rice by the method of transplanting, which is the method that secures a very clean cultivation, and is hence best adapted for killing all weeds including wild rice. This method if practised with pure seed, selected for non-shedding, would be very thorough in establishing a crop completely free from the shedding habit of the grain.

(6) Pure seed completely free from the shedding habit and suited for growing in that tract can be procured from the Rice Breeding Station for Mallad, situated at Mugad near Dharwar, in the Southern Division of the Bombay Presidency.

The Poona Agricultural College Annual Social Gathering 1928.

GENTLEMEN,

We, the staff and students of the College of Agriculture, Poona, invite the presence of all the past students of this College on the occastion of the celebration of the 21st Annual Social Gathering and Sports to be held on the 9th and 10th of August 1928.

The function aims at cementing the mutual tie of friendship and society between the professors and students, past and present.

We earnestly hope that all the past students will heartily respond to the call of the ALMA MATER by gracing the occasion with their presence and co-operating with us in making the function a grand success.

Any spontaneous out-come of help by way of contribution will be quite welcome at the hands of the General Secretary.

D. K. MAKHIJANI,
Hon. General Secretary.

OUR COLLEGE NOTES

:o:

On Mon day, the eleventh of June, our College reopened with a welcome address from our Principal Rao Bahadur P. C. Patil. Many familiar faces of those who passed out, were missed, but in their place many more new faces could be seen smiling in their success in getting admission to the College among a host of applicants. We heartily congratulate them for the noble choice of their profession. The Principal's address given elsewhere in this issue, howsoever sympathetic, encouraging and hopeful was not altogether unmixed. All through there was a tone of *Beware* and parental chastisement in inculcating lessons on making economic cuts in our expenditure and engendering a sense of civic responsibility in us "to make two grains grow upon a spot where only one grew before."

Our Examination Results: Out of the 79 candidates that appeared for the final B. Ag. degree examination, 64 were fresh students appearing for all the subjects. Of these only 32 have passed including Diploma students. This batch was started with 85 on the soll in June 1925. The percentage of passes in this batch thus works out to 38. Of the failed candidates only one has passed in Agriculture.

The results are indeed as shocking as they are disappointing. Evidently there is something wrong somewhere or everywhere. In a technical institution of the kind of ours where students have to keep on toiling in the fields or in lecture rooms, with the most rigorous discipline that obtains in the west, such a low percentage of passes seems to suggest a retrograde step in the progress of the institution. The university examinations are held only once in a year unlike in other Colleges of Art and Medicine. Matters seem to tend to extending the Course to four years by preparing the mind of the students to leave an additional margin of at least one more year to take their B.Ag. Degree Nothing can be more thear rending than this

Our hearty congratulations to all the successful candidates and heartier still to Messrs Menon, Amin and Miss Raju Bai Gujjar for standing highest in the Senior, Junior and I. Ag., examinations respectively this year. It is a matter of no small import to us that we have in the person of Miss Raju Bai Gujjar, a Champion of the Womanhood of India, in that she has defied one and all of her opposite sex–nay even the greatest man of letters who has branded her as being weak and fragile.

" Frailty, thy name is Woman.
A rose bud set with a little wilful thorn "

A word more to the new comers: they may perhaps be aware of the fact that ours is the sportliest of the 5 colleges in Poona, tiny though in numerical streugth. We are in possession of most of the trophies and it is up to you now to prove efficient sportsmen. Professionally also our is a study of constant Communion with Nature. Possibly there can be nothing under the sun which does not come under our study; and immense are the possibilities for enriching our mind with knowledge duing the 3 years at our disposal: anp it is for you now to make or mar yourselves.

On the 12 th of February 1928 the Agricultural College-Rovers had their Camp Fire at the Mandke Den. Mrs Burns opened the Camp fire, Dr. Burns presiding. Most of the students and staff members graced the occasion by their presence. The Camp fire over, Dr. Burns concluded the function, saying that scouting has now become a reality and not a show from the very fact of its permanence and widespread for over 20 years. One would never have thought that the booklets that appeared in London in 1907 should have been so grimly prophetic of the substántive reality of scouting to day twenty-one years after. He wished to see the day when he could see only scouts everywhere. He regretted Prof. Trivedis' inability to be present on the occasion being absent at Bombay due to his mothers' illness. He, our asst. scout Commissioner, would certainly have given more life to it if he were here to conduct the function.

We record with pleasure the appointment of Rao Bahadoor P. C. patil, as Ag. Principal during the leave vacancy of Dr. Burns proceeding to England and we gladly welcome to our midst once again Mr. V. G. Gokhale, Deputy Director of Agriculture Konkan, as acting Professor of Agriculture in lieu of Prof. Patel being appointed as Deputy Director of Agriculture, Gujarat. Also we feel extremely glad for the recent appointment of Prof. Trivedi as Irrigation Engineer, Bhavangar State, although it is no small loss to miss a Professor of the type of Trivedi from our midst. We heartily congratulate Mr. Vasavada on his appointment as Ag. Professor of Agricultural Engineering in the place of Prof. Trivedi, and Mr. P. J. Patel for taking Mr. Vasavada's place.

We are extremely glad to add to our list of the few M. Ags, one more name Deshpande, who took his M. Ag. degree in Entomology this year, Our hearty congratulations to Mr. Deshpande for the same,

S. M, RAO

GYMKHANA NOTES.

——:o:——

The last General Body meeting for the year 1927-1928 was held on the 10th February 1928 to elect office bearers for the year 1928-1929. The following gentlemen were elected for the various items shown against their names.

Hon. General	Secretary	Mr. N. R. Bhide.
Tennis	„	„ S. M. Gupta.
Cricket	„	„ V. S. Chaphekar.
Foot ball	„	„ O. C. Zachariah
Hockey	„	„ V. N. Kelkar.
Athletics	„	„ G. T. Marwadi.
Gymnasium	„	„ B. T. Vipat.
Minor games	„	„ P. R. Gupte.
Reading Room	„	„ V. B. Bhavkar.
A. A. and D. S'	„	„ N. R. Bhat.

MAGAZINE COMMITTEE.

President :—Dr W. Burns.

Editors :—Mr. V. G. Deshpande M. Ag.

„ S. Madhavrao B. A.

Senior Manager Mr. P. S. Kulkarni

Junior Manager Mr. V. K. Shaligram.

We are very sorry to part with Prof. J. P. Trivedi, our worthy Chairman, who gave valuable advice from time to time, and made the Gymkhana work in a most efficient manner.

Our cricket department has begun its work in right earnest and we hope that our team will achieve the same credit as it did last year in the Inter Collegiate Sports.

Our Annual sports will be held at the time of Social Gathering and we request all to begin practising for the various items and make the sports a perfect success. These sports will also serve our sportsmen as the preliminary training for the coming Inter Collegiate Sports.

The First Gneral Body meeting for this year was held on 25th June. The following additional office-bearers were elected.

Prof. A. A. Vasavada was elected as a Chairman of the Gymkhana in place of Prof. J. P. Trivedi. Mr. M. B. Naik was elected as a Secretary for Reading Room vice Mr. Bhavakar resigned.

Gen. Secy. Social Gathering	Mr. D. K. Makhijani
A. A. & D. S.	„ Hegde
Member without Port Folio	„ Lodhikhan.

We thank Mr. S. B. Pandya who volunteered his services and managed the Reading Room before the new elections took place.

N. R. BHIDE,
Hon. Gen. Secy,
Agricultural College Gymkhana.

OLD BOYS.

—():o:()—

Mr. V. K. Kulkarni has gone for private farming in his village near Dharwar.

* * * *

Mr. D. G. Kulkarni has been appointed on the effluent farm at Hadapsar.

Mr. Shah has been appointed in the Engineering section at this College.

ACKNOWLEDGMENTS.

We have great pleasure, in acknowledging with thanks, the receipt of a copy, of the book titled "Physical Culture" by Prof. L B. Bhopatkar, M. A. LL. B. Vice Principal, Law College Poona.

We are thankful to the Manager, Macmillan and Company Limited, Bombay, for sending us, "Manual of Dairy Farming" by B. K. Ghare, L. Ag. (Bom).

Owing to want of space, we cannot publish, reviews on these books, in this issue.

OBITUARY

We are extremely sorry to record the death of Mr. B. Iswaralal Senior B. Ag. class on the 4 th of March 1928, at the Sasoon Hospital. He died of typhoid after a period of three weeks confinement to bed. He kept us in anxious suspense for the first 4 days of March, wavering between doubt and hope; but the cruel hand of death snatched him away from our midst inspite of the best medical aid and nursing given him. He was a good natured young man, buoyant, cheerful and of a happy-go-luck disposition. As our General Secretary for the Gymkhana he was second to none of his predecessors The tenth of February was a glorious day in his life, when he handed over charge to his successor amidst loud cheers of applause from the students and staff, but Alas, the tenth of March was not to be his!! May the departed soul rest in peace!

UNIVERSITY RESULTS 1928.

EXAMINATION FOR THE DEGREE OF M. Ag.

1 Bhat, Shambhu Shambhu
2 Desai, Bapubhai Bhimbhai
3 Deshpande, Vasudeo Ganesh

EXAMINATION FOR THE DEGREE OF B. Ag.

(NEW REGULATIONS.)

Second Class (in order of merit)

	Name.	Special Subject.
1	Menon, Nelichlal Shankara	A. Chem.
2	Patel, Somabhai Motibhai	P. B.
3	Bederkar, Vasudeo Krishna	I. S. C.
4	Mulwani, Bhagwandas Termal	A. Chem.
5	Patel, Umedbhai Bhailabbhai	P. B.
6	Kulkarni, Laxman Gopal	P. B.
6	Chellaramani, Thadharam Jethanand	P. B.
6	Kulkarni, Digambar Gopinath	I. S. C.
7	Kulkarni, Vasudeo Kashinath	I. S. C.
8	Irani, Rustom Aspendiar	Hort.
9	Kondwikar Yeshwant Kashinath	I. S. C.
10	Panditrao, Dattatraya Balwant	P. P.
11	Mir, Azharuddin Hussain	A. H. D.
12	Bhat, Pandurang Narayan	A. Chem.
13	Jani, Manilal Hari Narayan	Ag. F.
14	Motafram Sohra Dorabji	I. S. C.
15	Honap, Sitaram Govind	I. S, C.
16	Khandekar Bhalchandr Ganesha	Ag. E.
17	Aiyangar Ranganath Shriniwas	Ag. E.
18	Patel, Motibhai Nathabhai	P. B.
19	Buranuddin Hussain	Ag. E.
19	Vora, Manharlal Dhan Sukhram	I. S. C.
20	Lanewalla Sadiquali Gulam Hussain	I. S. C.
20	Patil, Krishnaji Ramchandra	I. S. C.
21	Gujjar Dhanji Valji	Hort.
22	Dutt, Pradyot Coomar	I. S. C.
23	Parab, Shantaram Iatoba	Hort.
24	Trivedi Gayantilal Manishankar	Hort.
25	Dhumma, Bababsaheb Mallikarjuna	I. S. C.
26	Manjrekar, Gajanan Yeshwantrao	I. S. C.
	PASS CLASS.	
1	Aiyangar, Narayan Shriniwas	Hort.
2	Bhalerao, Mahadeo Sadashiva	Hort.
3	Chaudhari, Waman Gopal	Hort.
4	Koppikar, Bhawanishankar Ramchandra	I. S. C.
5	Patel, Haribhai Fakirbhai	Hort.
6	Sawant, Sayaji Narayanrao	Ag. E.
7	Vashi, Ambulal Kashnaji	I. S. C.
	(OLD REGULATIONS).	
	Second Class	
1	Desai Abdul Rehman Mohomed Yusuf	A. Bot

(NEW REGULATIONS).

Passed in Subjects III & IV—Botany & Plant Pathology only.

1 Amin K. C.
2 Apte, N. S.
3 Arain, A. A. R. B.
4 Betigiri, A. R.
5 Chafekar, V. S.
6 Desai, B. K.
7 Desai, D. G.
8 Deshmukh, M. R.
9 Divgi, R. D.
10 Dongre, S. S.
11 Gadre, V. T.
12 Gayawala, P. M.
13 Goswami, R. N.
14 Govande, G. K.
15 Hegdekatti, G. M.
16 Kale, V. K.
17 Kelkar, D. G.
18 Kulkarni, P. S.
19 Kureshi, M. U.
20 Kurhade, S. K.
21 Lokeshwar, R. V.
22 Madhavrao, S.
23 Mahajani, S. S.
24 Nagarkatti, N. S.
25 Naik, M. B.
26 Nair, K. R. R.
27 Neswi, T. R.
28 Nikam, B. G.
29 Pandya, S. B.
30 Panjwani, B. C.
31 Patel, A. F.
32 Patel, M. V.
33 Patel, R. B.
34 Patel, V. M.
35 Patel, M. G.
36 Patwardhan, W. B.
37 Phadnis, G. S.
38 Pradhan, D. Y.
39 Savnur, P. K.
40 Sayed, I. S. A.
41 Shahani, K. K.
42 Shahani, W. P.
43 Shaikh, B. M.
44 Trivedi, J. M.
45 Upadhyaya, D. C.
46 Vakil, S. M.
47 Yardi, H. V.
48 Zodge, N. G.

(Passed in Subject III—Botany only).

1 Bhave, R. G.
2 Bhonsale, K. K.
3 Marwadi, G. T.
4 Mulye, T. V.
5 Palande, S. R.
6 Vartak, K. V.

(Passed in Subject IV—Plant Pathology only).

1 Bhat, N. R.

INTERMEDIATE EXAMINATION IN AGRICULTURE.

First Class (in order of merit)

1 Gujar, Raju Bai
2 Purandare, Sadashiwa Tryambak
3 Menon, Padinjara Marath Kochappan.

SECOND CLASS

(in order of merit)

4 Karapurkar. Y. M.
5 { Gupta, S, M.
  Memon, M. B. A. K.
6 Modak, P. A.
7 Dalwadi, P. A.
8 Patel, R. B.
9 Kanase, B. A.
10 Zachariah, O. C.
11 Kulkarni, N. T.
12 Shah, S. M.
13 Gupte, P. R.
14 { Joshi, G. R.
  Sunthankar B. R.
15 Parmar, C. U.
16 Pandya, M. N.
17 Mirajkar, L. H.
18 { Desai, B. R.
  Desai, B. L.
19 Nagori, I. A.
20 Deshpande B. A.
21 Sabnis, T. G.
22 Nag, P. C.
23 Samant, P. B.
24 Keskar, S. B.
25 Rawal, T. N.
26 Solomon, S.

27 { Atodaria, M. R.
Baser, N. K. }
28 Dananrawar C. V.
29 Patel, P. A.
30 { Gayake V. P.
Malghan V. A. }
31 { Desai K. M.
Jahi D. H. }
32 Purohit, P. K.
33 Tulsiani, R. M.
34 Gokarn, M. R.
35 Shinde B. V.
36 Ram Chandra
37 Patel, J. A.
38 Vipat B. J.
39 Hiranandani, G. J.
40 Rane Y. S.
41 Patankar A. B.

PASS CLASS

Deshpande, H. V.
Gadgil, J. G.
Kelkar V. N.
Khateeb, K. H.
Kibe, M. N.
Kulkarni H. V.
Lele, D. B.
Makhijani J. K.
Mali, U. T.
Pandya, C. J.
Shaligram V. K.
Thakore, P. S.

DIPLOMA RESULTS

(Alphabetical Order)

B. Ag. Examination

1 Chougule, A. B.
2 Don Engine.
3 Syed Vahiuddin,

Passed in subsidiary Examination

1 Madhavan

I. Ag. Examination.

1 Agha A. H.
2 Sidiki M. S.

LIST OF BOOKS RECEIVED IN THE COLLEGE LIBRARY.

R. S. V. Ayyar—Manu's land and Trade laws.
P. K. Wattal—The population problem in India.
L. F. R. Williams—India in 1917-18, 1921-22, 1922-23, 1923-24, and 1924-25.
O. B. Jesness—The Cooperative Marketing of Farm products.
W. O. Buxton—Book keeping simplified.
J. P. Howell—An Economic Survey of rural Parish.
H. Westergard—Economic Development in Denmark.
C. Beck—The Microscope.
R. M. Stewart and A. K. Getman—The Teaching of Agricultural vocation ... ... Professional Schools and Post Graduate course &c.
G. W. Forster—Agricultural Economics Laboratory Manual.
Brayne F. L.—Village uplift in India.

H. Higgs—Palgrave's Dictionary of Political Economics 3 volumes.
C. S. Sherrington—Science for all.
D. Mac Cuaig—Stepping stones to Cricket, Football, and Hockey &c.
H. M. Leake—Land Tenure and Agricultural Production in the Tropics.
W. H. Moreland—India at the death of Akbar.
F. L. Darrow—Masters of Science and Invention.
J. Adams—The Student's Guide.
R. Mukurjee—Groundwork of Economits.
... ... Visitors' Guide to Singapore.
... ... Natural Science in adult education.
... ... Report on Public Instruction in the Bombay Presidency.
W. N. Bond—An Introduction to Fluid Motion.
H. Buckley—A short History of Physics.
H. E. Hadley—Everyday Physics.
A. G. Rustom and C. V. Dawe—Farm Measurement.
L. L. Whyte—Archimedes.
H. F. Wilkin(—Marvels of Modern Mechanics.
L. Trittle anb J. Sutterly—The Theory of Measurements.
H. W. Roberts—R's Method of using ordinary set square &c.
L. Kelvin rnd Tait—Treatise on Natural Phylosophy 2 volumes.
G. Beiby—Aggregation and Flow of Solids.
J. E. Braham—The care and maintenance of steam plant.
W. P. Flderton—Frequency curves and correlation.
C. Bald—Drainage for planters.
W. A. Tookey—British Oil Engines.
G. F. Swain—The Young man and Civil Engineering.
R. H. Pinkerton—Hydrostatics and Pneumatics.
C. V. Durell—Readable Relativiiy.
W. H. Besant and Ramsey—A Treatise on Hydromechanics Parts I and II
C. P. Lawuner—Economic Farm Buildings.
A. H. Gibson—Natural Sources of Energy.
J. C. Connan—Data for Engineering Inquiries.
R. M. Evans—Arithmetic and Surveying.
H. C. Harris—Motive Power Engineering.
T. H. Macbrid—The North American Slime moulds.
F. H. A. Marashall—The Physiology of Reproduction.
B. D. Drain—Essentials of Systematic Pomology.
Chandler W. H.—Fruit Growing.
J. W. Morton—Commercial Strawberry Culture.
J. L. Cotter—A simple Guide to Rock Gardening.
A. S. Galt—The Principles and practice of Horticulture.
J. J. Taubennaus—Diseases of Truck Crop and their control.
W. Newell—Diseases of Crop plants in the Lesser Antilies.
A. Kruhm—The Vegetable garden.
... ... Proceedings International Conference on Plant Breeding Vol. I.
W. Good—Allotment Gardening.
W. F. Bewley—Diseases of Glass house Plants.
E. P. Phillips—A preliminary List of known poisonous Plants.
J. Hutchinson—The families of Flowering Plants I.
C. C. Hurst—Experiments in Genetics.
M. Kimmer—Scientific Feeding of the Domestic animals.

J. B. Sumner—Text book of Biological Chemistry.
W. H. Hilton Brown—The oil and colour Chemists Handbook.
J. M. Kelhoff &c.—Indicators &c.
L. E. Andes—Animal Fats and oils.
C. Mcoaner &c.—A Shikari's Pocket book.
M. N. De—Anatomy of Siikworm and Moth.
A. S. Pearse—Animal Econogy.
H. F. Fernald—Applied Entomology.
J. F. Marshall—Principles and practice of Mosquito Control.
Baker S.—Tha Fauna of British India Vol. IV.
... ... Varieties of potatoes with their synomyms immue from wart diseases &c.
R. A. Wardle and Buckle—The Principles of Insect control.
... ... Madras Agricultural Department Year Book for 1926.
W. R. Dunlop—An Investigation of Certain Process and conditions of farm.
A. J. Turner—The effect of Temperatnre and Humidity on cotton &c.
... ... Do —The effect of subjecting cotton to repeated blow room treatment.
R. S. Curts—The Fundamentals of Live stock juding.
... ... Agricultural Research in 1926.
Weaver J. E.—Root Development of vegetable crops.
Beckett E.—Vegetables for home and exhibition.
P. Work—Tomato Production.
Corrie F. E.—Lime in Agriculture.
A. J. Macself—Soils and fertilisers
L. J. Horlacner—Sheep Production.
A. Parrish &c.—Artificial Fertilizers.
C. S. Plumb—A study of Farm animals.
E. T. Brown—Your few acres.
V. A. Rice—Breeding and Improvement of Farm animals.
I. R. Ainsworth Dayis—The principles of agriculture.
H. Hunter—Oats &c.
J. Hammond—The Physiology of Reproduction in the cows.
Whitney M.—Soil and Civilization.
A. B. Bruce &c—Crop and Stock Improvement.
W. Dyke—Manures and Fertilisers.
Stewart H. R. &c—The Board of Economic Inquiry Punjab.
C. C. Inglis—Note on the Effluent Farm near Poona.
... ... Official report of the International Cotton Congress held in Egypt.
H. Chaturjee—Colonization of Date Tracts &c.
Agarwalla T.—Economic Study of Cattle Industry.
H. Chaterjee—The possibilities of Date sugar Industry in C. I. and C. P.
" Sugar Industry and Agriculture on Improved lines &c.
Das S.—Development of Indian Sugar Industry.
... ... Annual Report of the Indian Central Cotton Comittee for 31st August 1927.
K. I. Advani—Nomenclature of Sind Crops.
G. S. Henderson—The Pusa Pedigree Dairy Herd in North Bihar.
A. J. Turner—Technological Reports on Standard Indian Cottons 1927.

Department of Agriculture, Bombay

LEAFLET No. 18 OF 1927

Method of obtaining good Jowar seed in the East Deccan

In an area where the scarcity of rain is likely to be the cause of a low yield of the *jowar* crop, every important item in the cultivation of crop is highly important and among these items the use of good seed is specially important.

The present method of obtaining seed in vogue with cultivators in the East Deccan is the selection of good healthy heads either from the standing crop in the field or from the threshing yard. These are preserved and used at the time of sowing. In this method there was found a regular mixture of different size of grains, big, medium and small in size. This is mainly due to the fact that the grains on the head develop at different times and consequently produce different grades of grain—some are properly developed, some undeveloped and some under-developed. These latter two kinds of seeds are always smaller in size and although they may germinate well in the field, they fail to produce a good even crop.

Thus to get an excellent crop, fully developed seed of *jowar* must be secured from the selected heads. In other words, big grains should be separated and obtained and the small seed should not be used for sowing. This separation of the bigger grains is not difficult. It can be done by means of a sieve. Small sieves of different sizes with holes six to seven to an inch, made of perforated zinc sheets, can be obtained at 12 annas each. A set of such sieves will last for years together and will be useful to a number of cultivators. In such a sieve, 75 per cent. of the small grain is taken out and only big seeds remain. The exact size of the holes required for any particular type of seed must be determined for the variety used in each case.

The value of sieving *jowar* seed in this way has been shown by an experiment at Mohol (Sholapur District) where

B 2177

seed from selected heads without grading by sieves was compared with the sieved seeds from the same heads.

Kind of seed.	No. of grains in a Tola.	No. of plants per acre at harvest time	Yield per acre.	
			Jowar grain.	Straw (Kadbi).
			Lbs.	Lbs.
Seed from selected heads without grading.	395	20,410	626	926
Graded seed from selected heads.	351	24,105	952	1,352

The seed graded by means of a sieve has given the following advantages over ungraded seed: -

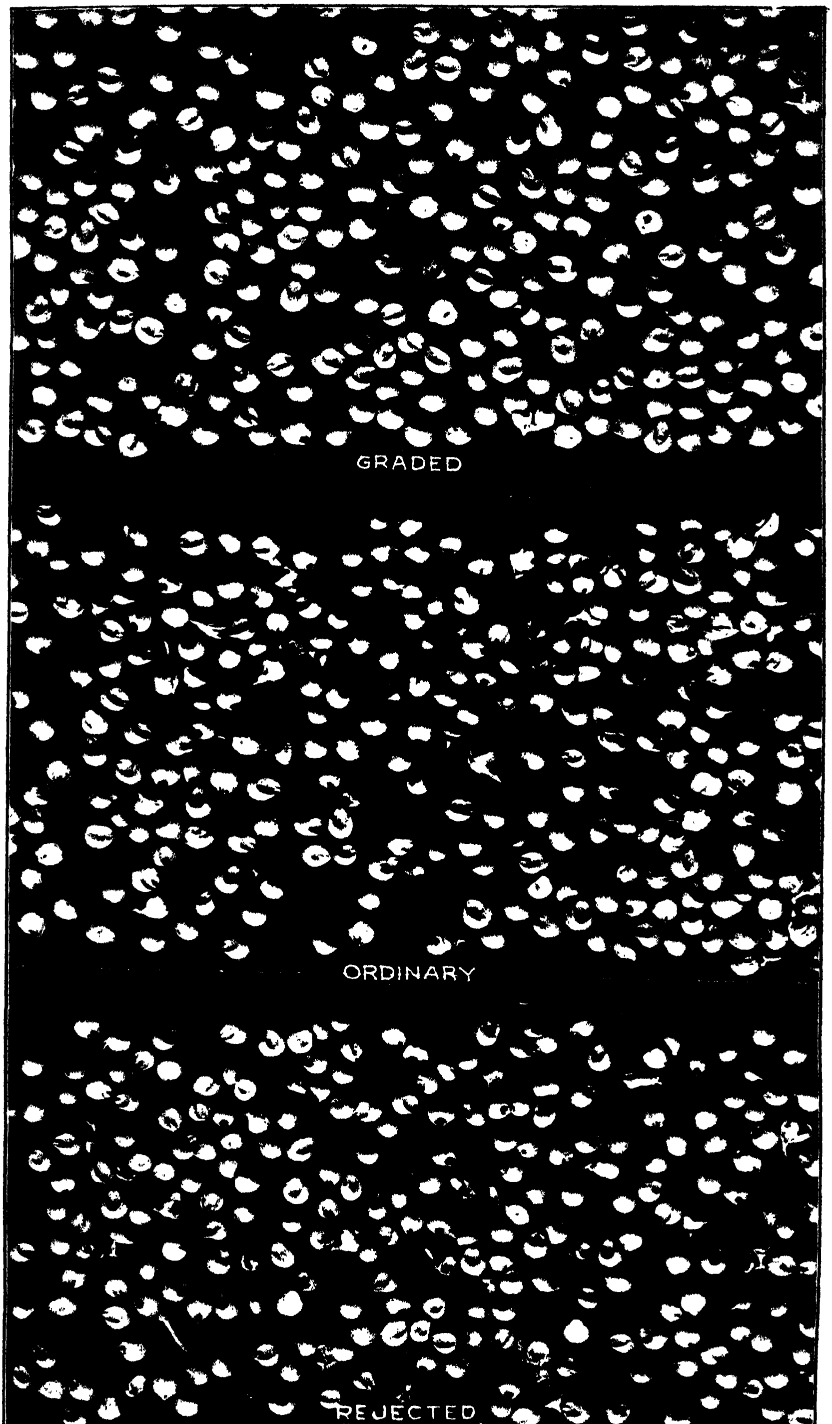
(1) Higher germination and consequent higher number of plants per acre.

(2) Increase in yield of grain by 52 per cent. and *kadbi* by 46 per cent.

Cultivators as a general rule do preserve their own *jowar* seed after selecting their heads and will not find difficulty in grading the seed in the above way. The cost of sieves is very small and these will be useful for a number of cultivators for a number of years. Cultivators are, therefore, strongly recommended to take advantage of this method of getting good seed and thereby secure a better profit.

The Agricultural Overseers in each district will assist in getting suitable sieves for the *jowar* of the area, and in showing how to use them.

PRINTED AT THE YERAVDA PRISON PRESS, POONA.


GRADED
ORDINARY
REJECTED

Department of Agriculture, Bombay

LEAFLET No. 20 OF 1927

Drainage in Orange and Mosambi Plantations on the Deccan Canals

The growing of fruit, and particularly of oranges and mosambis, has extended much in recent years on the Deccan where irrigation water is available from canals. But the growers of these fruits are faced with the difficulty that there is often too much water in the soil and subsoil, from the canal, and that the soil is usually black cotton soil. As a result, unless special precautions are taken, the orange and mosambi trees cease to be healthy, after about five or six years, the shoots of the trees begin to die, and the plantation is ruined. The destruction of the shoots of the trees is termed *die-back*, and in this disease the younger shoots die from the top downwards. The dead shoots stand out prominently, and they may be found dead right down to the main stem. Whole plantations, single trees, and patches of trees may be affected. The roots of affected trees turn black and are covered with rotting bark. The disease usually appears about the time of the first or second bearing of the trees, and in about four years the trees die. The chief cause of the trouble is the presence of too much water in the soil caused by lack of drainage.

Treatment of the Disease.—At Kolhar, in the Ahmednagar District, there is an orange orchard, belonging to Mr. Govindrao Narayanrao Kulkarni. It is situated in deep heavy black soil in the midst of copiously watered sugarcane fields, and itself receives water from the canal. The land is sloping from north-east to south-west and the soil is heavy and deep. There was no way for excess water to drain off from the soil. This situation was aggravated by the large quantity of water from the neighbouring irrigating fields spreading into the soil of the orchard. Under these circumstances the tree showed the first symptoms of *die-back* at the early age of only six years. About four years ago, when the trees were seven years old, they were attacked to a certain extent by the disease. Their yield was fast diminishing, and the disease rapidly progressing. The owner was at a loss to see his way through this difficulty. It was suggested to him to try deep trenches so that any excess of water could be drained away in the trenches from his own orchard, as well as water percolating from the neighbouring fields could be effectively prevented.

To this he readily agreed to give a trial, and long trenches were dug on the borders of the orchard, not more than about six feet from the rows of the trees. The trenches

were two feet in breadth and four feet in depth. They have been left open, and in the course of time their sides have been overgrown with deep-rooted grasses like hariali and there is no fear of their being damaged by rain, to any great extent. These trenches do not receive any water directly from the irrigation canals, but water will be found in them all round the year, *see* photograph No. 1. The trenches have been dug on three sides of the garden, and at the lowest point arrangement is made for the water to go into a *nalla*. Trenches were dug in December 1924 and January 1925.

At the same time as the trenches were dug, all the dead branches of the trees were removed, and a dose of manure was given as follows:—

January 1925	... 4 baskets of cattle manure per tree.
March 1925	... 1 lb. of bone meal per tree.
June 1925	... 4 lbs. of castor cake per tree.

The cultivation was done by the usual local methods. The result was that all the trees without exception revived by renewed growth of green foliage and branches and in about a year and a half, the whole plantation came to the stage of heavy bearing. The symptoms of the disease have almost disappeared. In short, the good drainage effected by the trenches converted the whole orchard into a blooming plantation of trees in excellent health as is shown in photograph No. 2.

An account of the cost of the trenches will now be essential. The figures given here will vary according to local conditions of labour and wages. In the garden cited above, the total length of the trenches comes to 1,500 feet with a breadth of two feet and a depth of four feet. This amounts to an excavation of 12,000 cubic feet, and its cost comes to Rs. 90 only at the rate of 12 annas per 100 cubic feet. The number of trees being 475 in the trenched area, the cost of trenching per tree comes to annas three only. The trenches are left open and require to be cleared about three times in the year and this operation costs about Rs. 50 for the whole year, that is to say, about two annas per tree.

Apart from the revival of diseased trees by means of the trenches, it will always be advisable to provide for the trenches whenever a new orange or mosambi plantation is started in the canal irrigated area in the Deccan. It is safer to foresee the danger of *die-back* and to provide for trenches as a precautionary measure, rather than to introduce them later as a remedy against the disease. The trenches should be left open rather than closed, as this would reduce the initial cost as well as the cost of re-digging after a few years when they might be choked up.

PRINTED AT THE YERAVDA PRISON PRESS, POONA.

Photograph No. 1.

Showing water running in the drains about six feet away from the row of orange trees. The drain is four years old with 4 ft. depth and 2 ft. width.

Photograph No. 2.

Showing the growth of Mosambi orange trees four years after the drains were made.

On page 1, line 12, *omit* words "(*See* plant No. 1.)".

/ **Department of Agriculture, Bombay**

LEAFLET No. 23 OF 1927

Economic Method of Controlling the Pomegranate Caterpillar

The pomegranate plant has no worse foe than the *anar* caterpillar (*Virachola isocrates*) called "*sursa*" in Marathi. When the plants are in flower, or when the fruits are not bigger than a betelnut, a small butterfly lays white eggs in them. These eggs hatch, and a small caterpillar enters the fruit by boring a hole, and attains its full size in the inside of the growing fruit. The fruits become, on this account, quite unfit for use. (*See* plant No. 1.) In the Deccan in certain plantations the damage done extends even up to 90 per cent. of the fruits formed. No method of poisoning the caterpillar has been of any use in dealing with this pest, since the caterpillar feeds inside the fruit.

The only remedial measure so far known is the enclosing of fertilized flowers and young fruits, in bags, after they have been found to be free from any eggs of the caterpillar. From the experience gained at the Modibag, Agricultural College, Poona, for the last five years, we can now confidently say that the method is quite practicable, and can be used in a commercial plantation. The bags are prepared in the following way:—

Brown thin paper known as "*kraft paper*" of superior quality should be used for preparing the bags. The paper is sold very cheap in Bombay by any wholesale paper merchant at about Rs. 5 per ream of 500 sheets. Each sheet of paper is 40 inches by 27 inches in size, and 8 bags of 8 inches by 6 inches each, sufficient to hold a large-sized fruit, can be prepared out of it. So one ream will suffice for 4,000 bags. The paper, one-eighth of the whole sheet, is folded in duplicate and the two edges of the fold are pasted by sticky gum. Here it should be noted that the sticky substance is sometimes likely to be washed away in heavy rains. If possible, it is better to put one or two stiches along the each edge above the gummed portion. Ordinary babul gum can be used. When the bags are prepared in this way they

may be used for enclosing the unaffected flowers or fruits. The mouth of the bags is tied with a piece of twine or thread to the fruit-stalk. At the time of harvest if the bags are carefully handled and preserved, many of them can be used for the next year's crop.

Though the whole operation looks lengthy and troublesome, it is not so in fact. The following detailed figures will give an idea as to the actual cost, labour, and saving of the crop:—

Cost of preparing 2,000 bags

		Rs.	a.	p.
(1) *Kraft* paper, ½ ream	...	2	6	0
(2) Gum, superior quality, 1 seer	...	0	12	0
(3) Preparation of bags, 5 men for one day	...	3	2	0
(4) Tying of bags, 10 women for one day	...	3	2	0
(5) Twine, 4 bundles	...	0	10	0
Total	...	10	0	0

Thus at a cost of Rs. 10, a crop of about 2,000 fruits can be saved. The number of fruits harvested is usually proportional to the number of bags used. By bagging the fruits the outer colour of the rind may not be so attractive but at the sacrifice of the colour the whole fruit can be saved.

PRINTED AT THE YERAVDA PRISON PRESS, POONA.

Pomegranate flowers and fruits bagged in the garden.

Department of Agriculture

LEAFLET No. 24 OF 1927

THE BUDDING OF WILD *BOR* TREES IN GUJARAT

During the last few years, *bor* has become a favourite and much desired fruit in Gujarat as well as in the Bombay Market. Consequently the demand for its cultivation has been considerably stimulated, and is so keen that fruit growers find it very difficult to get good and reliable plants. As a result of trials made in the last few years, it has been found that all wild plants of *bor* (*Zizyphus jujuba*) and *chani bor* (*Zizyphus rotundifolia*) in the districts of Surat and Ahmedabad can be budded with choice varieties of *bor*. The method of budding is as follows.

Wild bor.—The plants are headed back in the month of February or March, leaving about a foot of the stem above the ground. From the cut end the young shoots sprout. The strongest shoot alone is protected, while the others are cut out. When this shoot grows to a thickness of half an inch, it is suitable for budding. It generally takes about two months before such sprouts are big enough to be budded. It is, therefore, some time in the month of April or May that budding operations commence. The buds are selected from wood, one season old, of the choice kind. Bud sticks are immersed in water for a few hours before the buds are removed for use. The method of removing buds and fixing it on the stock is illustrated in the diagram.

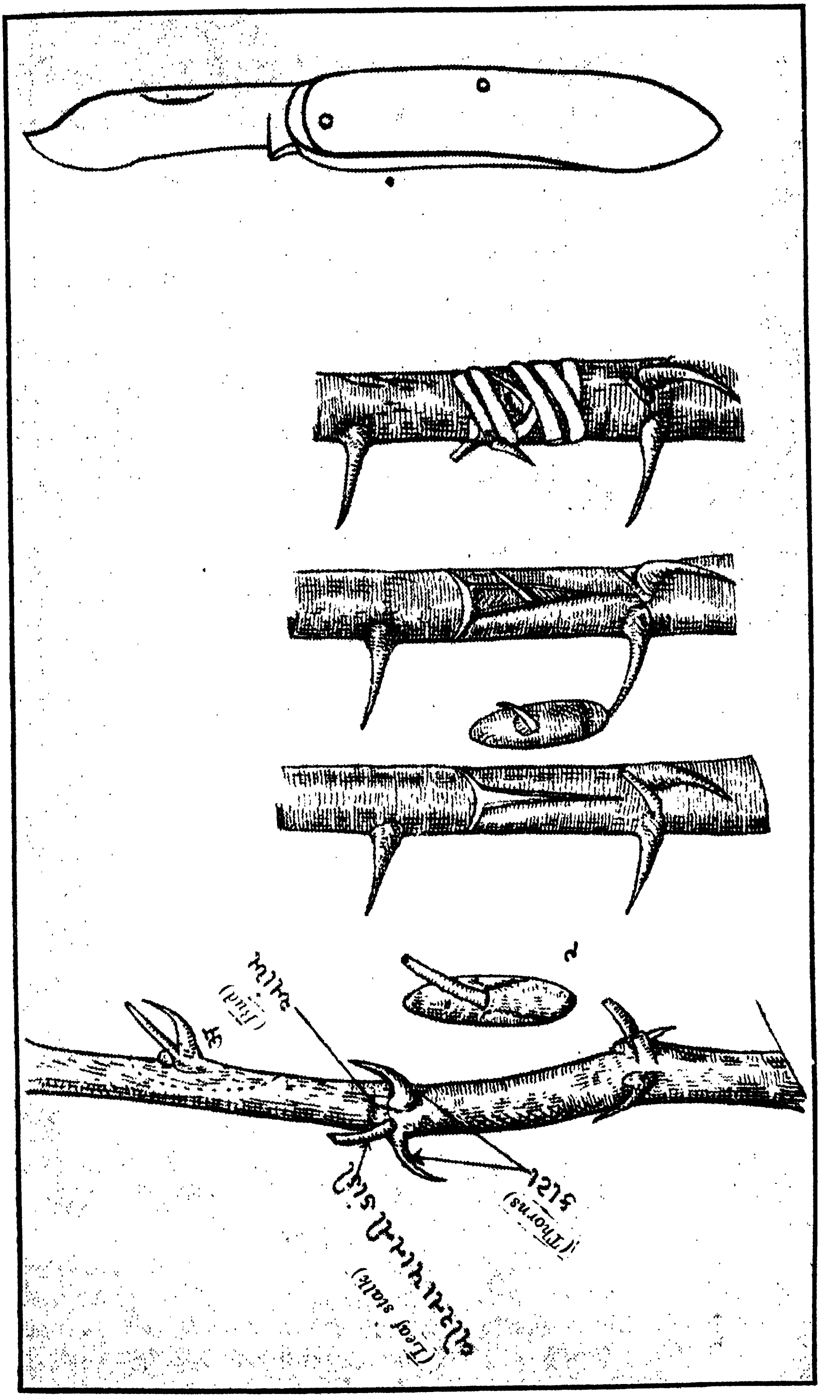
If such buds remain green for a period of seven to eight days, it can be taken for granted that they are properly set. Ten days after budding, if the buds are green the stock is cut off about four inches over the insertion of the bud. Such buds sprout after about twenty days. When the bud growth is about six inches long, the tip is cut off to allow the growth to branch. Within a year, this growth develops into a tree and gives a harvest of about four to six pounds at the end of that period. A full yield of fruit is obtained after four years.

Such budded plants should be properly earthed up and a basin made round the stem to give support to the plant and to hold rain water.

Chani bor (Zizyphus rotundifolia).—These bushes also have been successfully budded in the district of Ahmedabad. The bushes are headed back and few young sprouts are selected for budding purposes. The method of budding is the same as explained above. The plant in this case remains a bush.

Q 25

Photograph showing how wild *bor* trees are headed back and branch selected for budding. The branch will be budded at the height shown by the string. The bark of branch so selected must be half ripe, brown coloured, full of sap and must easily tear by a slight touch of finger nails.


Budding knife
1
3
4
5
(Bud)
(Thorns)
(Leaf stalk)

1. Bud stick, showing in outline at "A", the cut that should be made for removing a bud.

2. A detached bud; while detaching the bud a small part of the wood is left attached to the underside of the bud. This wood is dexterously removed by means of finger nails taking care that the slimy underside of the bark is not disturbed. The thorns near the bud should be carefully removed without tearing the bark. The leaf stalk is allowed to remain attached to the bud.

3. For the reception of the bud, a T shaped incision is made just through the bark of the branch of the wild *bor* tree. Then the flaps of the bark are loosened. This operation is usually performed by means of a special type of knife called budding knife. The blade of this knife is very sharp and specially curve shaped to suit the purpose for which it is meant. The handle of the budding knife is made of ivory or smooth bone and its flat, thin end is specially designed to loosen the bark of the operated stem without disturbing the underside of the operated bark. In absence of a budding knife, any good knife can be used with care.

4. A bud in place is shown.

5. The bud must finally be tightly bound into place by means of a flat bandage preferably prepared out of dry banana bark.

BOMBAY: PRINTED AT THE GOVERNMENT CENTRAL PRESS.

Gratis [FIRST EDITION

DEPARTMENT OF AGRICULTURE

LEAFLET No. 25 of 1927

DRY FARMING IN THE DECCAN

Dry Farming is the system of Agriculture which makes the production of useful crops possible in the countries which receive less than 20 inches of rain in the whole year. Even in places where the annual total rainfall may amount to 25 inches or more, we often experience partial crop failures due to bad distribution of rain. Now such failures can be avoided and crops produced with a fair amount of certainty by resorting to the system of dry farming in such tracts of precarious rainfall.

The chief aim in this method is to receive and absorb the whole of the rain-water into the soil and more important than this is the conservation of this absorbed water before and during the growth of the crop and make it available to the crop itself.

It is well known that some of the Agricultural important districts in the Bombay Deccan and Karnatak, such as Ahmednagar, Sholapur and Bijapur, are subject to periodic famines and scarcities due to the vagaries of rainfall. Eastern portions of several other districts also experience similar conditions of drought, scarcities and famines. The experiments carried out since 1924 at the Dry Farm Experimental Station at Manjri, which is situated in the tract of such precarious rainfall, indicate the possibility of mitigating these famine conditions in most tracts to a very large extent.

Selection of Land.—It must be understood that all lands are not suited to dry farming, and hence the first step in the practice of dry farming is the proper selection of land. As a rule unless there are fair chances of June and July rains, Rabi-crops alone should be tried with reasonable hopes of success. And under such conditions where the crops to be grown are Rabi we must have a fairly deep fertile soil. The mimimum depth should be at least two feet. If, however, the places are situated in tracts where usually early monsoon

rains in June and July are almost certain a Kharif crop may be grown by the application of the methods of dry farming. The land for the Kharif crop may be comparatively shallower varying from 12 to 15 inches, the soil being not altogether poor.

Levelling and Bunding.—The lands chosen for dry farming should be level as far as possible. If the lands are not level, they should be made level as far as possible. But whether the lands are level or not they should be divided into levelled plots each surrounded by small bunds nine inches high. It is convenient to divide the land into small portions of ten gunthas in area, and bunds placed round this unit. These bunds can be easily placed by opening a furrow with a heavy turnwrest plough throwing the clods on one side and then trimming these bunds with a shovel These small embankments should not cost much if made in this way. But they serve a great purpose. Such levelling and bunding prevents the loss of rain-water and the washing away of the fine particles of soil by surface run-off, and holds the whole of rain-water, even when it comes in heavy downpours amounting to several inches in one or two hours. This accumulated water gradually soaks down into the lower depth of the soil and becomes useful later on, for the growth of the crop.

Preparatory Tillage.—Having selected the right type of land and having made it level, the next essential step in dry farming is the thorough preliminary cultivation of the land. The land must be ploughed as deep as possible by an iron turnwrest plough soon after the harvest of the previous crop.

The Gallows plough, if available, should be used to ensure deep ploughing for the Rabi crop, while smaller plough like Kirlosker's plough No. 100 will be quite suitable for the Kharif crop of Bajri. The clods after exposure to the Sun for some time should be broken with a disk-harrow if possible and then further pulverised by the country blade harrow by working two or three times before rains, stubbles and weeds if any being removed during these operations. These harrowings with the blade harrow are to be continued after every substantial rain of more than half an inch till the sowing time. The deep ploughing increases the storage capacity of the soil for water and the repeated harrowings ensure absorption of the rain-water and at the same time prepare an efficient covering of loose soil on the surface

which prevents the evaporation of moisture from the lower layer of soil. In the case of the Kharif crop the number of such harrowings may be three or four after rains while in the case of *Rabi* crop they may vary from four to six or even more, before the actual sowing of the crop.

Selection of the crop.—Our experience at Manjri is confined to two main grain crops only :—*Bajri* as a Kharif crop and *Jowar* as a Rabi crop. Wherever there is a fair cer ainty of receiving nearly half the annual rain in the months of May, June and July, a Kharif crop of Bajri may be grown especially on shallower lands. But when a greater portion of the annual rain comes in the months of September or October, a Rabi crop of *Jowar* should be grown. Manjri being situated in a tract where both July and September rains are received with certainty, both Kharif *Bajri* and Rabi *Jowar* are grown according to the nature of the soil.

Sowing.—The important point to be remembered in sowing is the very low seed rate to be used, and the proper depth to which the seed is sown.

With a view to allow free interculturing during the growth of the crop the distance between rows of plants should be 15 to 18 inches and the seed sown should never be more than six pounds of either *Bajri* or *Jowar* per acre. Even then, thinning of the plants must be done after the crop has grown 4 or 6 inches above ground. Dipping in copper sulphate solution to prevent *Jowar* smut must not be neglected. The *Kharif* crop should be sown four inches deep while the Rabi *Jowar* should be sown six inches deep with a heavier drill.

Interculturing and formation of mulch.—No sooner the plants are 4 or 6 inches above the ground, if there be no rain, the upper 2-inch surface layer of the soil should be stirred with Planet Junior Hand-hoe or some similar implement. A man can interculture nearly one acre of land in one day with this implement. This operation is the very basis of the system of dry farming and throughout the growth of the crop this operation has to be repeated every 10 or 12 days, as circumstances permit, till the formation of the ear-head. This loose layer of the dry-soil on the surface, forms the dust-blanket and prevents the heating of the lower soil by the heat of the Sun, stops the evaporation of moisture from the lower depth and prevents the cracking

of the soil. The weeds are also eradicated by this operation. For a Kharif crop four to five such hoeings and for a Rabi crop six to eight such hoeings are necessary. The results of *Bajri* and *Jowar* crops obtained on the Dry Farm at Manjri for the last two or three seasons are given below :—

Yields of Bajri Crop on the Dry Farm at Manjri

Year Total Rainfall	1925 14·38 inches		1926 19·63 inches		
—	Yield of grain	Yield of straw	Yield of grain	Yield of straw	Yield of Tur
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
No bunds : Soil stirred to 1″ deep ...	366	996	1,372	2,423	445
Bunds : Soil stirred to 1″ deep ...	415	871	1,310	2,612	664
Bunds : Soil stirred to 2″ deep ...	438	781	1,269	2,492	612

Yields of Rabi Jowar on the Dry Farm at Manjri

Year Total rainfall	1924 25·94 inches		1925 14·38 inches		1926 19·63 inches	
—	Yield of grain	Yield of straw	Yield of grain	Yield of straw	Yield of grain	Yield of straw
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Bunds : Soil stirred to 1″ deep.	932	3,542	380	1,091	884	1,464
Bunds : Soil stirred to 2″ deep.	1,035	3,087	445	1,335	1,037	1,868

In this part of the Poona District the normal yield of *Bajri* crop is only 340 pounds of grain; whereas the normal yield of Rabi *Jowar* grain is 500 pounds. According to the Anna valuation of crops the Kharif and the Rabi crops in the year of 1925 were valued as eight annas and six annas respectively. But even in this year of very low rain the dry farming methods could secure more than the normal crop of *Bajri* and nearly ten annas crop of *Jowar*. In the years of good and moderate rains twice the normal yield of Rabi *Jowar* was obtained, while with moderate rain the *Bajri* crop was very high indeed.

In the methods recommended above the most important point to be noted is that there is no extra out-of-pocket expenditure to be incurred. The sole expense is for the extra labour for preparation of the land and for interculturing, which can be supplied by the peasant cultivator in the dry-tracts of the Deccan.

BOMBAY : PRINTED AT THE GOVERNMENT CENTRAL PRESS.

Gratis [FIRST EDITION

Department of Agriculture, Bombay

LEAFLET No. 26 of 1927

IMPROVEMENT OF LEMON CROP BY BUDDING

The commonest method of propagating the Kagdi lemon plants in the Deccan is to raise them by seedlings first and after about a year and half, when they attain a height of about two feet in length, they are transplanted in their permanent places. Such trees commence bearing from 5th or 6th year from the date of planting and the resulting fruits are not always true to type.

Although often a good harvest can be obtained by the above method of growing lemons, now it has been observed by us that better results can be achieved if instead of seedlings, budded plants are selected for the new orchard. The advantages of the budded plants over the seedlings are—

(1) that they commence bearing earlier by two years.

(2) that the size and quality of the fruit is greatly improved.

(3) that the resulting fruits are always true to type.

To encourage the practice of lemon budding in our nurseries, we propose to give in this short leaflet, the method of budding as follows :—

1. *Raising of stock plants.*—Jamburi seeds when fresh are sown in nursery beds in the month of July. Seedlings when about four to five inches high, should be transplanted in open sunny beds. When transplanting, roots may be trimmed short. Here the seedlings are planted fairly close at a distance of six to eight inches, to induce the plants to grow without branching on the lower part of the stem at a height of about eight inches from the ground. If the beds are properly worked by deep digging and adding a good quantity of old farm yard manure with occasional stirring of the soil the plants grow fast and become ready for budding on in about eight to ten months, but ordinarily the plants take twelve to fourteen months.

Q 80

2. *Selection of budwood.*—Selection of buds is very difficult in Kagdi lemons. Invariably the buds are found in the axil of thorns. On account of these thorns it becomes very difficult to remove the buds. This seems to be the reason why the lemon budding is not taken up on the same footing as those of santra and mosambis. However if carefully observed the lowest few buds on a season's growth are often without thorns. Such buds though normally very small, can be made to swell in about a week by prunning the upper thorny portion of the branch and then can be used as scions.

3. *Budding operations.*—When the Jamburi stock attains the thickness of a lead pencil and when it is in sap flowing condition that is to say when the bark is easily separable from the wood below, it is in fit condition for budding. This condition is found from the end of June to the end of February. Light digging and light manuring helps to get such conditions within ten days. A vertical slit of an inch is made on the main stem of the stock at a height of 6 inches from the ground and the bark is loosened. The plant is bent. So naturally the slit widens and facilitates easy insertion of bud in an ordinary way. The operated plant is then tightly tied with banana fibre keeping the bud exposed. After one month, when the bud swells, the top of the Jamburi is cut two inches above the budded portion. Care is taken to remove all growths coming out from the stock below the budded portion. In the following rainy season the budded lemon plant is transplanted in its permanent place.

BOMBAY : PRINTED AT THE GOVERNMENT CENTRAL PRESS.

Bombay Department of Agriculture

LEAFLET No. 27 OF 1927

SOME USEFUL TYPES OF PADDY FOR THE KANARA DISTRICT

The rice lands in Kanara can be divided into two types—one high lying lands called "*makki*" in Kanarese which almost entirely depend on the rainfall for the production of paddy crop and the other lowlying lands which command better facilities of water than the *makki* lands and are richer as a matter of fact for crop production. On account of these factors, the early ripening varieties growing within 4 to 4½ months are taken on the Makki lands, while late varieties ripening in a period of 5 or 6 months are grown on the lowlying lands.

From the results of the experiments conducted on the Kumtha Farm during the period of 1918 to 1922 and the experience in the district on the cultivators' plots, a variety called "Muscaty" paddy introduced from South Kanara has been found to be useful and suitable for the high lying lands which do not command sufficient water facilities and depend entirely on rains. This variety ripens in 120 to 130 days and is found quite suitable in the coastal belt of Kumtha and Honavar Talukas of the Kanara District.

"Muscaty" variety is a fine white kernelled paddy capable of being turned into both parboiled *ukad* rice and clean rice, and hence is preferable to the coarse red grained types generally grown at present on such soils. In comparison with the local types of Chilaga, Dasar Patta and others which are grown on such soils at present, it gives 15 to 20 per cent. more yield and having white rice it fetches somewhat higher price than the local coarse red varieties and on an average gives a net profit up to Rs. 15 per acre.

The variety does not need any special treatment other than what is given to the local varieties grown on such lands, and can be said to be better resistant to drought than some of the local varieties.

Q 81

This is also found suitable for *viangan* (Kar in Kanarese) crop maintaining its superiority over the local varieties as in the case of rainy season crop.

Halga Paddy

A second type of paddy suited for lowlying fields of the up-ghat talukas of this district is named Halga. It was introduced from villages of Yellapur and has been found to be useful under conditions of lowlying types of soil whêre late varieties ripening in 5 or 6 months are found necessary. The variety has a medium round white grain with thin husk.

Being useful for conditions of soils where transplanting is done, namely, in the interior villages of Sirsi, Siddapur and Yellapur Talukas, it can replace the local varieties as Vabya, Hansu, Mallage, etc., with an increase of yield 12 to 15 per cent. estimated at a net profit of Rs. 15—20 per acre.

This variety has a greater tillering power than the local types and hence fewer seedlings in a bunch (4 to 5) should be planted. Apart from this, no other special treatment is necessary. This variety can be grown on nearly 60 per cent. of the rice fields of the up-ghat talukas.

Precaution.—During the first two years, careful search in the fields should be done to weed out mixtures of local varieties grown from the fallen seeds of previous harvest. Arrangements for the supply of pure seeds of both these varieties can be made on application to the Agricultural Overseer, Kanara, Kumtha, District North Kanara, and officers of the Agricultural Department.

BOMBAY : PRINTED AT THE GOVERNMENT CENTRAL PRESS.

ERRATA.

Page	98	Para	3	Line	1	for	*oxalis*	read	*Oxalis.*
"	"	"	"	"	2	for	*Euphorbea pipulifera*	read	*Euphorbia pilulifera.*
"	"	"	"	"	2	for	*Euphorbea*	read	*Euphorbia.*
"	"	"	"	"	3	for	*Andrpogon*	read	*Andropogon.*
"	"	"	"	"	3	for	*willd*	read	*Willd.*
"	99	"	1	"	8	for	*latifolina*	read	*latifolia.*
"	107			"	6	for	*Sine guinon*	read	*Sina gua non.*
"	108			"	16	for	*All*	read	*All's.*
"	108			"	29	for	increased	read	increase.
"	110			"	20	for	precipation	read	precipitation.
"	113			"	4	for	साच्त्रि	read	सचित्र.
"	114	stanza	1	"	3	for	grat	read	grot.
"	"	"	3	"	3	for	sing	read	ring.
"	"	"	4	"	2	for	Phoelms	read	Phoebus.

Editors—A. C. M.

THE POONA

AGRICULTURAL COLLEGE MAGAZINE.

VOL. XX.] SEPTEMBER 1928. [No. 2.

EDITORIAL NOTES.

The long expected Report of the Royal Commission on Agriculture was after all received in July last. Looking to the Report it will be seen that the Commission assembled on 11th of October 1926 and after visiting all provinces including Burma and examining the various witnesses terminated their tours on the 10th of December 1927; when they proceeded to Mahabaleshwar for writing the Report. During this period the Commission examined 395 witnesses, officials and non-officials and travelled over 18197 miles.

* * * *

It is a very voluminous report covering about 800 pages in all and is naturally expected to have thoroughly threshed out all the Agricultural problems and made suggestions which would help a speedy and a great advance in the Agricultural development of the country. The number of all recommendations suggested by the commission comes to about 600 in all and it is not possible to review them all thoroughly in such a short space. However we take this opportunity to express some of our views in the matter.

* * * *

By way of introduction while reviewing the whole Agricultural position beginning from 1858 up to date the Commission remarks that total production has increased, is beyond dispute. The increase has been due to various reasons, but it is doubtful if any appreciable increase in yield can be attributed to the adoption of better methods of cultivation or the increased use of manure. Further it is remarked that "in a country with such a long history, little surprise be felt that a system of tillage based on experience should have reached a stage beyond which further progress was bound to await scientific discovery." So it goes without saying nothing can be expected by way of recommendations regarding the improvement in cultivation. As to the actual tiller of the soil, the Commission remarks that inspite of the progress, the ordinary cultivator on his tiny plot is still a man of small resources with small means for

meeting his small needs. So it is he who requires all help which science can afford and which organisation, education and training can bring within his reach. Hence the object of the whole inquiry of the Commission has been to suggest ways and means of assisting the advance of the Rural community towards a fuller life.

* * * *

Thus the sphere of the Commission's inquiry has extended to the activities of all departments which are concerned with rural welfare and it examined the whole Agricultural position in all its aspects and made recommendations for improvement in the same.

* * * *

While scanning the various recommendations none appear to be so striking as the Imperial Council of Agricultural Research which is supposed to organize control and guide all Research work.

* * *

Speaking in general about the report as a whole it can not be said to be anything extra-ordinary and looking to the conscensus of opinions expressed about it through papers, the report has been described as not coming up to the expectation. Some of the opinions pronounce it as a " barren report. "

* * *

However it may be admitted on all hands that the report is valuable in so far it has put together all available information and will serve as an important record.

* * *

Now that the recommendations of Commission are out, it is to be seen which of the recommendations will be given effect to and what will be the changes in the Agricultural policy marking a new era in the Agricultural history of the country.

* * *

It was sanguinely expected that solution for some of the vexed questions like Fragmentation of land etc. will be found in the report of the Commission, but nothing definite has been said about it. The bill in connection with this was to come before the Council in the last meeting, but it was withdrawn by Government when it was seen that the whole atmosphere outside and inside the Council Hall was surcharged with the feeling of opposition some technical objection came to the rescue of the member in charge of the bill. The bill has then been postponed for the time being, but it will be again brought before the Council when the time will be propitious.

* * *

HOW AGRICULTURE IN INDIA IS BEING COMMERCIALIZED.

By

Rao Bahadur P. C. PATIL L. Ag. M. Sc. (Wis)

Professor of Agricultural Economics, Agricultural College, Poona.

(With kind permission of the Indian Broadcasting Company, Bombay).

Indian Agriculture is very old and even before 3000 years people used to grow various kinds of crops and used iron-tipped implements. They had small irrigation works, as well as irrigation wells.

In fact the change in Agriculture, from pre-historic period, was very little. Till about 100 years ago, there were no railways ; there were very few roads, and commerce with foreign countries and even in the different provinces of India was limited.

The farmer used to grow variety of things. He was considered to be the best farmer who grew all the things needed by his family. He grew staple crops and side by side patches of chillies, Turmeric, Tobacco, Sugarcane, Oil seeds and Fibre crops such as Cotton, Tag, Ambadi. The subsidiary crops taken in small patches provided spices, sul, oils, ropes and clothing. The farmer crushed castor seed and made oil for lighting ; he extracted fibre from San and Ambadi, and made ropes for his implements. The house-wife ginned, carded and spun cotton, the local weaver wove the yarn and local tailor made clothing.

Before many centuries, the village smith, carpenter, cobbler, potter, washerman and barber had established. These men had their small pieces of land and were paid by the villages in kind for their services. The whole community led a very simple and contented life.

There was very little commerce. People traded more by way of barter. Farming was followed as a means of livelihood and not a business for profits.

Since the British came and the country came in touch with western civilization, things are changing very fast. Extension o

roads, railways, steamers, motor cars, post, telegraph, telephone and even wireless communication is established with other countries and between the different parts of the country. The farmer now grows not for his family alone, but for the markets in this and other countries. He is not satisfied with few staple crops like his forefathers. He eats many things which are probably raised in other parts of the country and some even in other countries. He uses many things which his forefathers had not seen.

In place of little patches of sugarcane, cotton, oil seeds, chillies and tobacco, along side the large plots of Jowari, Bajri or rice, he now grows special crops, on large scale and thus diversified farming is slowly yieding to specialized farming. The farmer now sets his eye more on the market. He sells his one or two special crops and purchases many others required by his family. Part of his produce is consumed locally while part goes outside even overseas. In the same way some of the foods, he consumes, are grown in the locality but many are grown far away and some beyond the seas.

In the old days therefore he was not required to deal with markets and middlemen. Spread of communication, and concentration of special crops in particular tracts brought him in touch with markets and middlemen. His education and training. for the changed conditions, is not adequate and the hosts of middlemen—Savkar, village trader, broker in the market-are exploiting him.

In the present days of interdependence of countries, provinces and communities, farmers cannot remain isolated; but due to the ignorance of farmers, also due to the peculiar nature of their vocation (or calling), Indian farmers are not organized. Naturally, therefore, they cannot face the organized communities in competition. The Savkars, Banias and Brokers who finance the farmers, the purchasers who buy their product and even the labourers who on their farms, are organized and the farmer community unorganized as it is, finds the struggle of existence hard and difficult.

There was a time when Indian farmer could live an isolated and contented life. The autocratic Government of the old age looked to the interests of the different communiities and arranged their relations and perhaps cared more for the agricultural community, as Government then entirely depended for their revenue on the farming community.

During recent years the British are democratizing Government. The different interests represented in the democratic representative Government are watching and safeguarding their own interests,

whereas for want of leaders and cooperation among farming community, their grievances are not brought forward and redressed.

It is therefore high time that the Indian farmers should educate themselves and organize. Organization will give them strength in

(1) Raising finance for production.

(2) Purchasing things that are required by him.

(3) Selling commodities that they grow.

(4) Requiring the district and taluka local Boards to improve and extend education and communication.

(5) Requiring the provincial and central legislatures to pass measures which are calculated to help Agriculture.

By way of opening societies and cooperative banks, organization will enable farmers to finance their production. These institutions will lend farmers money in time, without unnecessary bother, save good bit of interest and will give them opportunities to learn business.

Organization by way of cooperative sale societies, will give them control on market and will enable them to reduce marketing costs and save brokerage and also enable them to order the things they want, in large lots and thus get these cheap.

Organizations like agricultural associations of semi-political nature which are found in U. S. A. and Europe ought to enable the farmers to influence bodies like Taluka and District local boards and even the Provincial and Central legislatures. Though Local Self-Government is in the hands of the people the cities and towns are getting more facilities by way of more and better education and better roads at the expense of villages. In short organization of farmers will be of immense use in rural improvement, which is so essential in the days of commercialized agriculture.

CO-OPERATIVE IMPLEMENT SOCIETIES IN THE NAGAR DISTRICT.

By

RAO SAHEB B. P. VAGHOLKAR. L. Ag;

Deputy Director of Agriculture S. C. D. Poona.

(With kind permission of the Indian Broad-Casting Company, Bombay)

:o:

Nagar District in Bombay Presidency, comprises of 11 Talukas and one Mahal. It is always unlucky in not getting secured rain-fall every year unlike the Konkan or other Districts and hence it comes under Famine Area. As a consequence, the cultivators in general are poor, majority of whom, migrate for labour to Bombay, Khandesh, Berar and so on. Those that remain behind continue agricultural work and grow crops with the meagre means available with them.

Many of you, by this time, must have heard about Agricultural Improvements introduced by Bombay Agricultural Department; and one of the improvements, in addition to others, introduced into this District, is the use of Iron Plow. This was considered to be superior to country wooden plow in the following respects:—

(1) Less number of bullocks.

(2) Better and efficient work.

(3) Inversion of the land
and as a sequence to all,

(a) complete removal of permanent weeds and.

(b) better crops with less rain-fall.
and as a sequence of these two,

(a) more money to cultivators.

This improvement i.e. use of Iron Plow was found in 1905 and since that time it has been advocated to cultivators. But as you all know, the coservatism of cultivators and the cost of the plow postponed the adoption of the improvement to a longer period, and the Department had to use several means and methods to bring home this improvement to cultivators. The following attempts were made till its importance

was realised and a Co-operative Society was formed of Implements :-

(1) Demonstration of the Implement at villages and fairs.
(2) Free use of the Plow to cultivators.
(3) Demonstrations by means of growing crops, over the land of cultivators which were plowed and showing advantages of plow.
(4) Keeping the Plows on hire for cultivators by opening Depots.

In this way since 1907 to 1920 the Department did a good deal of work. By 1920 they had very useful Depots at Shevgaon and Newasa in the District, which hired out Plows. The hire charges realized from these two Depots in 1920 amounted to Rs. 562 as only Plow hire.

This preliminary work demonstrated and showed the use of the Plow alone to several villages and cultivators, when it was thought that a local organisation should be organised to substitute Departmental Institutions, and the work entrusted to them, so that the movement would be really beneficial to individual cultivators, who would realise the profits in the end, and learn to manage such institutions.

In 1922-23 the first organisation of Shevgaon Implement Society was started. In this, leading cultivators of several villages came forth and collected a share capital about Rs. 2925. Rs. 5 being the value of each share. The total number of members was 51 who contributed to share capital. After the collection of share capital 50 Plows were purchased and these were hired out to cultivators at a nominal rent of Annas 4 for four bullock and Annas 3 for two bullock Plow per day. The whole work was organised on cooperative system but was not registered. The Department rendered help of a Fieldman to work for the Society and the District Agricultural Overseer, Ahmednagar helped the members in the organisation of the Society. In one year a hire of Rs. 734 was received for plows worth Rs. 2785, and it was found that the plow was taken on hire by nearly 90 villages of the Taluka and by nearly 400 to 500 cultivators. It will be seen that on a capital investment of Rs. 2785 Rs. 734 were received as hire charges.

This encouraged the members to collect more capital and go in for more number of plows; and hence the society increased its stock from 50 to 110 and realised Rs. 3428 in the second year as hire charges over a capital of about Rs. 4600 including that of the 1st year. When the demand arose the Society reduced the hire charge by 50 p. c.

During 5 years the society

(1) has realised approximately Rs. 8870 on a capital of Rs. 5130-.
(2) has hired out Plows at only 9 Annas per acre to cultivator.
(3) has plowed lands amounting to 3,000 acres yearly
(4) has plowed lands of nearly 400 to 500 poor cultivators
(5) has plowed lands in 90 villages of the above number of cultivators and
(6) has paid cultivators yearly about Rs. 15,000 to 20,000 more in crops owing to this better Plow, which is no doubt a gain of the Taluka.

Even though organisation was started in 1922-23 the society was registered under Co-operative Act in 1925 and since then it has been named as Shevgaon Taluka Co-operative Implement Society, Shevgaon.

The example of this society was imitated by two Talukas of the Nagar District, Pathardi and Jamkhed. These Talukas started a very similar organisation in 1925 and 1926, Pathardi taking the 1st lead and Jamkhed following. Pathardi has by now,

(1) Share Capital of Rs. 2020.
(2) Number of Plows 100.
(3) Recoveries of hire Rs. 2818 since started; and Jamkhed as under :—
(1) Share capital of Rs. 1125.
(2) Number of Plows, 65.
(3) Recoveries of hire Rs. 1737 since started.

The recoveries of hire in the period of development will show the progress and it will be seen that attempts at these places was rapid and the cultivators were much benefited.

The three concrete examples of Co-operative Implement Societies will show to what extent these Institutions of cultivators have been beneficial to their brother cultivators and wherever possibilities exist such societies need to be started. So far the usefulness of these Institutions can be summarised as under :—

(1) The societies supply implements to poor cultivators at a low rate of hire.
(2) They can form as the best medium for dissemination of agricultural knowledge to cultivators by getting leaflets from the Department and any agricultural news.

Besides these two main benefits a third benefit can be got to cultivators through these institutions and that is supply of Improved Seed, manure and seeds of new crops. The Society comes in contact, as will be seen from above, with nearly 500 to 600 cultivators from about 90 villages and if arrangements are made with the help of Agricultural Department to purchase and stock seed from the Reserve Fund of the Society, it will serve a very good propaganda and would help both the cultivators and the Department. For the present this sort of propaganda i. e. supply of seed and manure is only restricted to Taluka Development Associations and Co-operative Societies meant for that purpose but if these institutions are allowed to do the same to the extent of their reserve fund and if the Members require it, such Institutions would be still more beneficial. As an experimental measure Shevgaon Implement Society tried to stock the Cotton, Bajri and Ground-nut seed and they distributed the seeds to the members of Implement Society. Hence wherever such Institutions exist and wherever Taluka Development Associations and Co-operative Societies do not exist, continuous attempts may be made by such Institutions to be useful to cultivators in this way.

Recently in the Shevgaon Implement Society stocking of seeds was done and it was found very useful. The chief requirements of such organisations are —

(1) Members from cultivating class from different villages.
(2) Share-capital at a nominal share value of Rs. 5 to be recovered in one or two instalments.
(3) Good Managing Committee.
(4) Part time paid workers to do the business of hiring and keeping record.
(5) Departmental advice and monetary aid in the early stages for some years till the business is established.

If any more information is required on this subject, Agricultural officers in the respective areas may be consulted, who will supply all possible information.

EXPERIMENS WITH GRADED AND SELECTED JOWAR SEED IN SHOLAPUR DISTRICT.

By

D. H. TAGARE ESQ.

Inspector of Agriculture, Sholapur

and

C. R. GOKAHLE ESQ. B. Ag.

District Agricultural Overseer, Barsi.

Importance of good seed for the cultivated crops especially dry, is sufficiently known to the cultivators and efforts are always made to obtain and preserve good seed.

Up to the present time only one method of obtaining good' seed of Jowar was practised by the cultivators viz. selection of ear-heads. This method consists in selecting healthy, bigger ear-heads on the threshing yard or better from the standing crop prior to harvest. The ear-heads are then stored as such or threshed and stored with glumes till they are required for sowing during the next season when the grain is cleaned and used.

In the Jowar head all grains are not of the same size. The grain differs in size according to the time it was allowed to develop and dry. However good a jowar ear-head may appear externally, it has got under-developed, un-developed and fully developed grains. Grain to be useful as seed should be fully developed. The under-developed and un-developed seed is smaller in size. This seed although possessing good germinating power fails to produce an even crop. The seedlings wither away and there are several blanks in the field. Thus in order to eliminate this defect and to get seed of larger and uniform size the seed should be passed through the sieve.

In the year 1926-1927 the graded seed was used on the Mohol Plot to see the results. The crop was even. The number of plants was more, and the yield was higher than the un-graded seed plot. Encouraged by the results a propaganda to introduce the system of grading was undertaken during the year 1927-1928. Demonstrations

of grading were held at several places in the Sholapur District. Cultivators liked the idea of grading the seed. There was nothing against it. Three standard perforated sieves are introduced.

No. 1 with small holes for Bajri.

No, 2 with medium sized holes for Jowar in dry fields.

No. 3 with large sized holes for Jowar under irrigation.

The price of each sieve is annas 12 only. It lasts for years together. A leaf-let has been issued describing the method of grading the seed with these sieves. During the year 1927-1928 more than 200 sieves of all sizes were distributed. The method of grading is simple. Practically speaking there is no extra expenditure in grading the required quantity of seed. This work can easily be done by the members of the cultivator's family. Even if a labourer be engaged to do the work he will sieve about 400 lbs grain in a day and obtain 300 lbs of big and good seed sufficient for 50 acres. The wages of the labourer will be annas eight per day. The rejected seed or grain is not useless. It can be used for eating purposes, as is now done. The rejected seed is as good as graded seed for eating purposes. The seed may be graded at any time. It may be sieved just before sowing or it may be sieved and stored at the time of harvest.

The quantity of Jowar seed graded during the last year was 80454 lbs, in this District. The seed was sufficient for 11493 acres.

It was arranged to have a special propaganda in the Barsi Taluka of this district. A kamgar was appointed for this purpose. The following 8 villages were selected for special attention.

(1) Barsi, (2) Gadegaon, (3) Yedshi, (4) Pangri, (5) Ambejavalge, (6) Kari, (7) Jamgaon and (8) Ghari.

The Jowar seed in these villages was graded by the Kamgar. The total quantity graded in these villages was 13906 lbs. Total quantity of seed graded in the whole of the Barsi Taluka was 19215 lbs.

The season was favourable and the germination was good.

The plots were watched throughout. The defference in growth between the two plots sown with graded seed and those of non-graded seed was remarkable.

The Crop Demonstrations were held at the following places :—

Name of the Place.	Date.
(1) Gadegaon	... 17-1-1992.
(2) Jamgaon	... 19-1-1928.
(3) Ghari	... 21-1-1928.

(4) Pangri ... 22-1-1928.
(5) Kari ... 23-1-1928.
(6) Ambejavalge ... 24-1-1928.
(7) Khangaon ... 25-1-1928.
(8) Yedshi ... 29-1-1928.
(9) Tadwale ... 28-1-1928.

79 plots of graded and non-graded seed were harvested separately. The results may be summarised as under :—

No. of plots.	Village.	Average yield of grain per acre.		Increase over non-graded Plot.
		Graded	Non-graded.	
		Un-irrigated.		
10	Gadegaon	1234 lbs.	824 lbs.	50 %
4	Do	780 „	595 „	30 %
4	Barsi	1230 „	945 „	30 %
4	Do	625 „	460 „	50 %
2	Do	570 „	330 „	73 %
2	Do	890 „	650 „	35 %
10	Pangri	896 „	668 „	33 %
8	Kari	980 „	775 „	26 %
10	Ambejavalge	974 „	710 „	27 %
10	Yedshi	1848 „	1404 „	31 %
		Irrigated		
10	Ambejavalge	1608 lbs.	1288 „	25 %
5	Do	2140 „	1840 „	16 %

This shows that the increase of yield in the un-irrigated plots varies from 26 to 73 percent and in the irrigated plots from 16 to 25 percent.

It can safely be said that there is 26 percent increase in dry cultivation and 16 percent in irrigated area. In the dry cultivation there is lot of withering and the number of plants reduced and under irrigation the withering is minimised and the number of plants is not reduced. This again shows that the graded seed withstood the effects of withering better than the non-graded seed.

The superiority of graded seed is clearly established. In none of the plots the yield of the graded plot is less than that of the non-graded plot. The grading of seed may safely be recommended to the cultivators, throughout the Presidency. The Co-operative Credit Societies may be requested to purchase at least one set of sieves and induce their members to get their seed graded. One set of three sieves for grading Bajri, Jowar and Wheat costs Rs. 2-4-0 only. This method of grading the seed is being popularised in other districts. There is also demand for sets of sieves from Sa'ara, Poona, Ahmednagar District and Sangli and Jamkhindi States. Porbundar and Bhavanagar States have also ordered these sets of sieves. This method of grading of seed is useful for every seed in every district.

Sieves for grading Bajri, Jowar and Wheat seed are kept ready for sale.

MERCURO-CHROME AND ITS USE IN ECZEMATOUS AFFECTIONS IN DOGS.

By

DR. B. B. JOSHI, G. B. V. C.

Lecturer, in Veterinary Science, Agricultural College, Poona.

—():o:()—

Eczematous affections in dogs are known by several names namely Fat mange, Red mange, Summer mange, Phagedenic scale, scale scab, Canker of the ear, Interdigital Eczema and so on. Eczema on the whole is a cutaneous disease, which appears in all breeds, it is non-contagious and is an inflammatory condition of the cutaneous membrane indicated by redness, swelling, nodules, pustules, fissures, scabs, and crusts, which are generally accompanied with more or less itching. It is not my intention here to describe the disease in this article as every practitioner knows it so well. My intention is to put before the professionals this new method of treatment which I find to be the best when compared with so many others so far in practice and I would certainly appeal to the professionals in general to give it a few trials and give their experience as to its efficacy. The

treatment with Mercuro-Chrome is very simple but rather costly; but those who know these various cases of Eczema in dog practices will certainly agree with me if I say how simple some cases are and how tedious and trying many others are with all the best treatment given, and as such cost is no consideration.

In the treatment of eczematous affections in dog practice we must consider the following facts:-

That in many cases the tar preparations which have been used almost exclusively are very harmful, as is also the method of systematically washing the animal with strong alkaline or carbolic soaps. The first thing to do is to give attention to the causes and find out from what cause the itching really occurs, as many cases of Eczema disappear as soon as the irritation has been suppressed.

We must first remove any cause of irritation that would tend to aggravate the condition such as dust, scales, dandruff parasites or any thing that would tend to prolong the condition. Filthiness of the skin and hair must be removed by bathing the animal thoroughly, taking care to use a clean superfatted soap that does not contain too much alkali and particularly avoid various soaps that contain crude carbolic acid or the irritating coal-tar-products so frequently seen in the "dog soaps" sold. It must be borne in mind however that too frequent bathing is apt to act as an irritant in eczema while it should be used to remove dirt. It must not be used frequently but as an actual necessity. In acute Eczema the irritated spots can be dried up by pressing absorbent cotton on the sore. I am not in favour of clipping the hair over the affected part. Use 1% to 3% solution of Pot. Permang. or 2½ % solution of Murcuro-chrome as a paint over the affected area. I have found in most of the cases Pot. Permang. solution very useful, but not in all. Mercuro-Chrome solution however has been the best in every case in my practice. It stops itching at once and this is the most important action of the drug that has led me to write this article. Once the itching stops any one of the usual dressing such as sulphur with zinc-oxide ointment or mere vaseline may be used. I have been able to cure the most obstinate cases of Eczema in my practice with Mercuro-Chrome treatment.

Finally care must be taken to prevent the animal licking off the medicine by putting on muzzles, bandages or covers over the body or chamois boots on the hind legs.

A METHOD OF PACKING MANGOES FOR DISTANT INLAND MARKETS.

By

MR. T. N. NENE.

Non-graduate Assistant, Ganeshkhind Botanical Gardens, Kirkee.

In Ganeshkhind Botanical Gardens, Kirkee, there are many groves of mango trees of choice varieties, fruits of which are sold every year by auction to the highest bidder. During the last few years, the highest bidder was, however returned from Poona or Kirkee markets, but this year the highest bidder was one from Bombay fruit-merchants.

The methods of packing followed by both, as it will be seen presently, differ from one another in many respects.

The Poona or the Kirkee leasee (the highest bidder) in consideration of the distance the fruits had to travel to reach the markets, (1) commenced harvesting the crop much later, i. e during the first week of June or a little earlier, (last week of May); (2) arranged the fruits in grass for seasoning, till they were ready for the table and (3) disposed them off to the customers either in the Garden, or in the bazars of Kirkee or Poona wherever the rates were inviting.

The Bombay leasee formed a company of about two dozens of men divided into three batches; (1) one looking to the harvesting, watching operations; (2) the other grading, packing and forwarding and (3) the third receiving and disposing them off to the customers in Bombay.

The first two batches arrived in the garden by about the 1st of May bringing along with them bamboo baskets, coir string, and gunny sacking for packing the crop to Bombay; other material for packing, such as dry banana leaves, fresh karanj (Pomgamia glabra) leaves &c; were secured from the garden on payment.

Here in consideration of the distance and the demand of his home market, harvesting had to be begun by about a fortnight or three weeks earlier, Till then the men were busily engaged in

making pickers, string bags and other repairs. Harvesting commenced on 16th May early in the morning. Thus the time of harvesting was shifted to about a fortnight earlier.

A ceremony of worshipping the tree was performed before regular harvesting was undertaken. Early morning of the 16th May, this was gone through and the gang started its work. It used to pick up those fruits which were half or more than half mature, leaving the rest of the crop to develop. In the case of Poona leasee, all fruits of a tree were harvested at the same time leaving none behind. Half mature fruits can only stand long journeys and this procedure is essential in latter cases. It is also the experiemce of the fruit merchants that the fruits harvested after the first shower of rain do not keep long. Pairi and Alphonso, if packed up half mature can remain in good condition for about a week and two respectively.

To continue the narrative, the pickers picked up the fruits gathered in their string bags and lowered the same to those who were collecting different lots and sorting them into grades according to the size and quality. Sometimes, however, all the fruits were collected and transported to the store where this sorting went on. Only sound, healthy and good fruits were chosen for sending to Bombay. Other fruits were sold off to the hawkers and poor customers.

Packing:—Before packing the men in the batch (number two.) counted the fruits into hundreds, one hundred holding 136 fruits each. (Poona hundred holds 318 fruits). A basket has a circumference of about 50 inches and a depth of 16 inches. It accommodated from 68 to 136 fruits according to the size and shape of the fruits, of all grades. Actual packing was like this :–A layer of banana leaves was placed on the bottom of the basket, on it was arranged a layer of some big size and some medium size mangoes. All small sized fruits of the third grade were then thrown on as a second layer, the third layer was again of medium sized fruits. The topmost layer was wholly made up of big sized fruits. (This is called in Bazar language "Mundha"). The space between two layers was stuffed up with dry banana leaves, while the topmost layer was covered over with young twigs of Karanj (Pongamia glabra). The top was then stiched properly with gunny sacking. Then the basket was ready for the journey.

As the journey occupied about 6 hours from 12 Noon to 7 P.M. in the evening, and it being too late for the Bazaar to receive the baskets for sale, the latter were usually disposed off early next morning. The fruits being thus disposed off, the empty baskets were returned to

Poona. These baskets are used over and over again for nearly six times. Thus the work of the company went on till about the 1st of June.

1. *Summary.* Bombay or distant markets cannot afford to receive ripe fruits. Fruits should be half-ripe and should need seasoning then.

2. Picking of those fruits only which are ready for harvesting is a means to prolong the season, and to be able to sell only good and sound fruits.

3. There does not seem uniformity in layering of the basket and in counting them in different tracts of the same province.

SOME NOTES OF THE SANTRA ORANGE AND ITS POSITION IN THE BOMBAY PRESIDENCY.

BY

S. S. BHAT, M. Ag.

The *Santra* orange is one of the two most important table varieties of citrus fruits in the Bombay Presidency, the other variety being *Mosambi.* The botanical name for both these varieties is *Citrus aurantium* The exact prototypes of these fruits, especially of the Santra, do not seem to be mentioned in the literature of the Western countries. What are generally called as the oranges in America seem to be more or less akin to the Mosambi orange. The Naval orange, the Malta orange, and the Jamaica orange are examples of these. They have the skin of their fruits close packed with the seg-

ments inside. The fruits are sweet. The Santra has loose-skinned fruits with its juice tasting sourish sweet. The Santra fruit is really delicious when ripe and is much liked in this country. In order to distinguish the Santra from the Mosambi, it is proposed to call the former (Santra) *Citrus aurantium,* loose-skinned; and the latter (Mosambi) *Citrus aurantium,* tight-skinned.

The origin of the Santra:— Like the other varieties of citrus, the Santra seems to have originated somewhere in Southern and Cochin China. (1) Citrus varieties are even at present found in a wild state also at the foot of the Himalaya in the North-Eastern part of India. There are many references to these fruits in the ancient Sanskrit literature. The very word Santra is probably derived from the Sanskrit "Sam" (सम्) meaning *well*, and "*tr.*" (तृ) meaning *to float*. The whole word Santra meaning one that floats well. The fruit of Santra floats very well indeed in water. The fruits were possibly observed coming to the southern inhabited parts, floating in rivers from the wilds at the foot of the Himalayas. Hence the name *Santra*, or the floating fruit, seems to have been given to it in the earliest times as soon as it came to be known to the ancient Sanskrit knowing Aryans. The other word *Narangi* seems to be similarly derived. *Narangi* is a curruption of the word *Naga-ranga. Naga* means red lead in Sanskrit. *Arangama* or *aranga* means one that becomes visible. Both these words form together the word *Nagaaranga.* or *Naga-ranga*, and mean one that has the red lead colour and that becomes visible or floats. Both the words *Santra* and *Naga-ranga*, or *Narangi* are discriptive. The application of discriptive names to objects is almost universally traditional in the Sanskrit language as in Latin. Further, the names of oranges in the original Khasi language are words like *Usoh Niamtra, Usoh sim, Usoh myanger* etc. These words do not seem to have any relation to the word Santra or Narangi. However, it is perhaps possible to derive the word Santra from the word *Usoh niamtra.* If the first letters "U" and "ni" are dropped from each of these syllables, what remains comes to be *Soh* and *umtra.* Now joining these two latter syllables a word like *Soh-amtra, Sontra* or *Santra* may be formed. Excepting this very doubtful likelihood it seems, therefore, more probable that the word Santra may have been a name given to the fruit by the Sanskrit knowing Aryans. Bonavia suggests the derivation of the word Santra from the word *Shans*, the name of the rulers in Assam about the beginning of the Christian era. This suggestion fits in well so far as the first part *San* is concerned. But how a syllable like *tra* came to be affixed is not at all explained.

It seems, therefore, possible that;

1. These words *Santra* and *Narangi* were non-existaent before the fruit was known to the Aryans. The Chinese and the Khasi languages have their own distinct vernacular names for these fruits.
2. The fruits were existing in the North-Eastern part of India before the Aryans came there.
3. The fruits are either indigenous in the North-Eastern parts of India, or they have been introduced there from the neighbouring countries in the East, in pre-historic times.

The spread of the Santra orange:—The spread of this fruit was not wide perhaps until the modern times. "Moreover, in Babar's Memoirs, Humayun writes that in his time about 300 years ago-the Samtarah orange was known only in one place in Bengal (1)". The seville (bitter) orange however, seems to have been naturalised in the Nilgiris and parts of South India from very ancient times, if it were not indigenous in those parts. Even now seedling trees of inferior types of citrus are seen growing in the wilds of North Kanara and South Kanara districts. Trees as old as about two hundred years of age are reported to exist. These trees are never cared for. They bear almost all the year round, yielding fruits of no high quality. The propagation of these trees is by seeds. These facts are indicative of the antiquity of the existence of these citrus types in the south of the Western Ghats. However this may be about the inferior types, the superior Santra orange seems to be of a recent introduction South of the Vindhyas. It is at present universally propagated by vegetative methods, and is almost always seen under cultivated conditions.

The distribution of the Santra orange in the Bombay Presidency:—Santra is the most widely cultivated of all the citrus varieties in the Bombay Presidency. This variety alone claims about 65 per cent of the total area under citrus fruits in this Presidency, which comes to about five thousand acres. The cultivation of the Santra orange is almost exclusively restricted to the three districts of Poona, Ahmadnagar, and East Khandesh, in order of intensity. The district of Poona alone has about 2000 acres under Santras. This area is mainly in the Purandhar, Haveli, and Sirur talukas. In Ahmadnagar, the Santra trees occupy about 1200

(1) *E. Bonavia:-The cultivated oranges and lemons of India and Ceylon.*

acres, in the Rahuri, Srigonda, Ahmadnagar, and Parner talukas. East Khandesh devoted about 600 acres to this fruit. In the other districts of this Presidency, the cultivation of Santra is not much.

Demand for the Santra orange and the extension of its cultivation:— This fruit is perhaps the most popular of all the citrus fruits of this Presidency. It is greatly in demand wherever it is available, and by all classes of people. It is usually sold somewhat cheaper than the Mosambi orange and is therefore preferred by the poorer classes. The cultivation of the Santra orange is really on the increase in the Bombay Presidency. Still, the fruits produced here are hardly enough to satisfy local demand. Considerable quantities of fruits are annually imported into this Presidency from the Central Provinces and elsewhere. The market of Bombay alone receives a large proportion of the Santra fruits every year, from outside. The extensive cultivation of Santra oranges is mainly controlled by the facts that.

1. the fruits are delicate and do not keep well for a long time after harvesting; they cannot be transported over long distances, without considerable loss in transit.
2. the trees are very sensitive to soil and moisture conditions; and
3. the trees are most easily susceptible to diseases like Dieback.

Santra orchards are therefore restricted to areas round-about large marketing centres like Poona, and wherever ample facilities for transport exist. They thrive well in a fertile loamy soil and in a dry climate. The cultivation of Santra in all the Konkan tract which has heavy rainfall, is almost nil. The Die-back disease is perhaps the worst enemy of the Santra trees, and their spread is much hampered by it. For these reasons the cultivation of the Santra trees is not as rapidly extending in the Bombay Presidency as the local demand for the fruits may require.

SUGARCANE IMPROVEMENT ON THE CANALS.

By

V. V. GADGIL Esq., B. Ag.,

Divi. Supdt. of Agri, Deccan Canals.

(With kind permission of the Indian Broadcasting Company Bombay).

The area under sugarcane on the Deccan Canals varies from 27000 to 30000 acres every year and the total value of the produce (Gur) amounts to 2·5 to 3 crore of rupees. From these figures you can judge the importance of the Sugarcane crop. During the last two years of the Great War Sugarcane cultivation had attained the greatest importance as the price of Gur had gone abnormally high. During these years there are several instances of cultivators who had realised more than 2000 rupees as net profit from the cultivation of one acre of cane and as a result people never cared for the expenses of cultivation during these days. Maximum yield at any cost was the order of those days. The price of Gur varied from Rs. 60 to Rs. 70 per Palla of 250 Lbs. and this may now be compared with the poor price of Rs. 20 to 25 per palla of the present day.

Before the Great War, the outturn of cane was not heavy and the price was also moderate but the cultivators used to spend within their means, leaving a fair margin of profit. The labour, manure and the cost of living was fairly cheap and there was not great difficulty about the finance. But at present, the circumstances are altogether changed. The labour has become very costly and inefficient, the prices of manure have gone high and the cost of living is proportionately increased. As a result the cost of cultivating cane is enormously increased and if the Agricultural Department had not given a helping hand in introducing several improvements, the Sugarcane Industry would have received a permanent set-back.

Let us therefore consider the lines of improvements adopted on the Canals in the cultivation of Sugarcane :—

(1) The first improvement is the introduction of iron-plows especially the Gallows plows, Ridgers and Sabul plows.

On the Deccan Canals you will not find a single cultivator who does not possess an iron plow. By the introduction of Gallows plow, the land can be plowed deep and there is no necessity of 2nd and 3rd plowing. The Ridging plow, although more costly, does the work

of opening furrows more effeciently and at a less cost. The Sabul plow reduces the cost of earthing up of cane by 50 p. c.

(2) The second improvement will be seen in the introduction of wide method of planting cane. Formerly the cultivators used to plant cane at a distance of 2 feet while at present almost all the planting is done at a distance of 4 to 5 feet without any reduction in the yield. The wide method provides suffieient plant food and allows the crop to be intercultured with bullock hoes. This method also results in the economy of water.

(3) The third improvement is the reduction of sets in Planting cane. 15 years back people used to plant 18000 sets in one acre but at present only 8000 sets appear to be more than sufficient for the same area. As the distance between two rows is widened, the number of sets is automatically reduced and it is a matter of great pride for the Department that by reducing the sets not only the cost of extra sets viz. Rs. 50 per acre is saved, but the outturn of the crop is increased to a considerable extent. The total saving by the reduction of sets comes to Rs. 75 per acre.

(4) Fourth improvement is one of the vital importance in the cultivation of cane, as it has solved the question of Farm Yard Manure and has kept up the fertility of the land. As stated above, Farm Yard Manure has become very dear and is not available in large quantities. Its price is increased by 200 p.c. To surmount this difficulty, the Department has successfully introduced the green manuring of San (Tag) which is more economical than the supply of Farm Yard Manure and which has rendered material help in adding humous to the soil. This method of green manuring is now adopted on all canals and has solved the problem of bulky manures.

(5) The fifth improvement will be seen in the introduction of concentrated manures for top-dressing which was practically not known to the cultivators 20 years back. These manures consist of various kinds of oil-cakes and artificial manures like the sulphate of Ammonia. At present nearly 60,000 Tons of Oil Cake costing more than 60 Lacs of rupees are consumed on the Deccan Canals for the cultivation of cane. Sulphate of Ammonia was only introduced during the last 10 years but at present 2000 Tons of this stuff, costing more than 4 Lacs of rupees, are utilised for Sugarcane every year. Both these manures have materially increased the yields and have brought large amount of profits to the cultivators. Along with this improvement the Department has also rendered material help in advising the proper time, dose and method of applying these manures to the best advantage of this crop.

(6) The next improvement will be seen in the introduction of new varieties of cane, such as Hebbal, Mysore No. 544, D. 109, Mauritius etc. in place of local Pundia variety which is found deteriorated especially on the old canals. The local Pundia cane is very delicate and requires careful nursing and watering. On the old canals like the Nira Left and Mutha the soil seems to have become sick of this variety and the ratoon crop can not be successfully taken. By the introduction of new varieties, this question is partly solved and people can confidently take the ratoon crop. The H. M. 544 variety of cane has also proved its superiority over the local Pundia even on the Pravara and Godavari Canals. The area under the new varieties is stitl rather small but it is sure to be increased in the near future.

(7) The introduction of Power Crushers and Bullock Power Mills of high effeciency is one of the splendid work of the Agricultural Department. Formerly the wooden Mills were very common and extracted 50 to 55 p. c. of juice. In the first decade of this century iron Mills were introduced by Mr. Ramji Bari of Poona and the percentage of juice was increased to 60 or 65 p. c. But since 1915 the area under cane began to increase rapidly and the attention of the well known manufacturers was drawn to the need of efficient mills. As a result we have now got Satara Mill, Chatanooga No. 23 and Kamal Crusher of Kirloskars giving highest extraction of juice varying from 68 to 72 p. c. All these Mills are worked by the Bullock Power and are suited to small cultivations. At present there are more than 3000 Mills working on the Deccan Canals. Roughly speaking 1 p. c. more extraction of juice means an addition of Rs. 10 extra profit per acre. Although these Mills are economical their out-put of work is very small and where a large area of cane is to be crushed, the necessity of Power Crusher was badly felt. With the help of the late Rao Bahadur Warad of Sholapur the First Power Crusher was installed in 1912 and since then Power Crushers began to increase rapidly. At present there are 45 Power Crushers working on the Deccan Canals crushing the cane of over 3000 acres. Among the whole lot, Chatanooga No. 45 and 92 are most popular and suit the requirement of cultivator The former can crush 15 Tons of cane per day (8 hours) while the latter can crush 25 to 30 Tons of cane during the same period. Besides the Oil Engine can be utilised for pumping, grinding ginning etc., when not required for the Power Crusher. The extraction is very satifactory and any hard variety of cane can be crushed. Almost all these Power Crushers are installed with the help of the Agricultural Department.

Power Crushers usually extract 4 to 5 p. c. more juice than the Bari Mill.

(8) After the cane is crushed the juice is required to be converted into Gur and the Agricultural Department has also done unique service in the introduction of the improved types of Poona, single, double and multiple furnaces which are essentially required for the manufacture of Gur. By the introduction of these furnaces a good deal of fuel is saved and the best quality of Gur can be manufactured by the burning of Pachat and Trash. The multiple furnaces have proved very useful for the Power Crushers and there is a good deal of saving in the fuel as the draft is utilised for partly heating the new juice. At present there are more than 150 multiple furnaces on the Canals. By the introduction of Poona Single and multiple furnaces there is a saving of 40 to 60 rupees worth fuel for manufacturing Gur of one acre.

(9) One of the drawbacks of these canals is that the over-irrigated area becomes water-logged and alkaline and if the drainage is defective, such area goes out of cultivation. The attention of the Agricultural Department is drawn to this problem for the last 20 years and the introduction of Java Method of planting cane in partly water-logged areas is the result of this investigation. By this method, Sugarcane can be grown in the neglected areas without much irrigation and trouble. This method is gradually gaining popularity. By the Java Method of cultivation the cane can be grown with 8 to 13 waterings for while ordinary system 35 waterings are required. By deep planting the roots get the benefit of sub-soil moisture and the number of waterings is reduced.

(10) Before finishing this talk I may mention here the most useful work done by the Agricultural Department in protecting the Sugarcane crop from the ravages of wild Pigs. Pigs were a great nuisance to the crop and to destroy them was beyond the means of ordinary cultivators. But with the cooperation of the farmers the Department had launched a successful campaign against these wild animals and most of these areas are now free from the Pig troubles.

From the above account the public will get a fair idea of the improvements introduced in the Sugarcane tract of the Deccan canals and how the Deccan Agriculturists are very keen in adopting labour-saving appliances and other technical matters concerning sugarcane.

A HITHERTO UNRECORDED DISEASE OF FOWLS.

By

Dr. B. B. Joshi. G. B. V. C.

Lecturer in Veterinary Science–Agrictural College Poona.

The menace of a disease is ever present and is the most serious question, keepers of poultry have to meet. Last hot season several out-breaks of a disastrous nature have taken place and apparently without any connection. Poultry-husbandry involves responsibilities which have not as yet been adequately realised. Keen disappointment has been expressed by those who have had their poultry swept away by this disease. In this article is described a disease not previously observed in this Presidency, and which appears to be distinct from any recorded disease of poultry. Many widely separated outbreaks have occurred and in all these the mortality has been about one hundred per cent. Affected birds showed a characteristic respiratory symptom very similar to that occurring in infectious Roup but the almost complete absence of changes in the trachea would appear definitely to differentiate it from that disease. In some out-breaks the disease showed many resemblances to Fowl plague or Typhoid. The origin of the outbreaks was not discovered in the beginning. But it was soon found out from the fact that in some out-breaks it started with fowls purchased from the market and the fact was confirmed further from reports that similar outbreaks occurred in U. P., Punjab, Madras, and elsewhere. The disease therefore can be said to be imported from places where fowls were purchased in numbers for marketing in Bombay and Poona. Several specimens of blood and viscera were sent for examination and nothing was found to demonstrate the casual organism. The disease therefore can be described as an acute febrile, contagious, infectious disease of fowls which greatly resembles fowl plague or Typhoid. It is caused by a filter passing virus and is characterised by a difficulty in respiration and high mortality. In some out-breaks the following symptoms were noticed:— The disease commences with depression and diminished appetite which condition soon changes to conspicuous dullness and sleepiness. In the mean time the comb and wattles become dark red and finally are blackish red in colour. On pressure of the bill a tenacious mucous oozes from the opening. Diarrhoea is observed in some cases and the droppings are dirty greenish fluid and towards the end of the disease the writer has observed in several cases great difficul-

ty in breathing, irregularity in walk and symptoms of paralysis. The disease runs a course with the exception of very rapidly terminating cases of 2 to 4 days.

In some out-breaks with the above symptoms there was found paralysis of the crop which was always found full with greenish dirty offensive fluid with all attempts of emptying and irrigation with various disinfectants.

The following medicines were tried :—Chlorine mixture, Iodine Terchloride, Isal Pot permang, Ammociated Tinct of Quinin, E. C. mixture, Tessol. Camphorodyne, Chlorodyne, Pulv. Rheico, Calomel, Subcutaneous injections of carbolic acid. Hydrogen Peroxide sol. Tobacco infusion, Garlic decoction, Homoeopathic drugs like arsenic sol. sulphur sol. Zeper's sulph &c. and the following mixture.

Sodi. Sulph.	...	4 ozs.
Mag. sulph.	...	2 ozs.
Ferri sulph.	...	½ oz.
Creasote mas.	...	10 minims.
Aqua	...	2 pints.

Mix and make a mixture.

Try a tea-spoon three times a day.

Many cases lingered with the treatment as long as three weeks but ultimately succumbed.

The following are the conclusions arrived at :—

(1) The disease here described although it bears many resemblances to fowl plague and Typhoid, appears to be a separate entity.

(2) It can be described as an acute febile contagious infectious disease of fowls which greatly resembles fowl plague or Typhoid. It is caused by a filter passing virus and is characterised by difficulty in respiration and high mortality.

(3) The virus is contained in the body fluids, organs and excretions of affected birds.

(4) The mortality in naturally infected flocks is usually about 100 per cent.

(5) Of supreme importance is prevention which can alone be achieved by the adoption of hygienic methods and by prohibiting the sale of infected birds individually or at auctions and markets where inspection is generally a farce, if there be any at all.

JACK FRUIT AS FAMINE FOOD.

By

V. G. PATWARDHAN Esq. M. Ag., M. Sc.

Asst. Prof. of Chemistry, Agri. College, Poona.

Jack fruit tree is a large tree grown throughout India but abundantly seen both cultivated and wild in the evergreen Sahyadri forests in the Western ghats even at a height of 4000 feet above sea level. The plant looks very picturesque when burdened with its monster fruits. In the beginning of the hot season, the tree begins to bear fruits and these become ripe just in the beginning of the monsoon *i. e.* in June and July. The fruit is used as a source of food both when it is ripe and unripe. Fruit is large, hanging on short stalks, oblong, fleshy with a thick cylindrical receptacle rind muricated, seed reniform (oily). Fruit itself is an aggregation of fruits produced by an assemblage of flowers. Individual fruits are called flakes. They consist of a seed surrounded by a pulpy mass of lucious tissue having strong odour. Leaving out the external rough skin, the yellow pulpy mass which surrounds the seeds is eaten and is known in Marathi 'Garā.' The fruit is 12 to 18 inches long by 6 to 8 inches in diameter. Each fruit contains 50 to 150 flakes. The 'Garās' or pericarps are very soft, juicy and sweet to taste containing as much as 15 p. c. of total sugars. If these are fermented and distilled, yield a highly intoxicating liquor with strong odour and peculiar flavour.

When the fruit is fairly developed but not actually ripened, it is used as a green vegetable. There are certain varieties, the fruits of which, do not ripe well and sometimes fall down before they come to the stage of ripening. Mainly there are two varieties one is known as 'Kāpā' and the other 'Barkā'. These names are given from the type of fruits obtained. Kāpā fruits contain pulpy mass of lucious tissue known as pericarp surrounding the seed, as thick, easily separable, stiff and less juicy while the 'Barkā' as thin, sticky, soft and quite juicy tissue. 'Kāpā Garās' are comparatively less sweet than 'Barakā Garās.' These 'Garās' form one of the choicest articles for the table in the hot season.

The fruits from the variety grown only for vegetable and from the 'Barkā' variety generally, are used for making cooked vegetable. This cooked vegetable forms an important article of food and in bad seasons, often becomes the only food of the poor people of the hilly tracts.

The dry seed when roasted can also be used as an article of food. The seeds in the season are collected and preserved after drying for further use as vegetable. Later on even they are ground and preserved as flour. The seeds contain much of starch and they are used in a variety of forms.

From the above description it can be seen that the fruit can be used as an article of food in three forms; namely—

(1) Edible portion of the raw fruit-as green vegetable.

(2) 'Garās' or pericarps surrounding the seed as a dainty (being the relished part of fruit).

(3) Seed or seed flour as a starchy food.

It will therefore be better to discuss the food value of these three different portions separately.

The following are the figures of analysis of the three different portions of fruit in which form they are used as articles of food.

Jack fruit analysis.

	Edible portion of the unripe fruit (used as vegetable.)	Garā or pericarp of the seed (used as dainty)	seed (used as starchy food).
	p. c.	p. c.	p. c.
Moisture	64·26	69·20	42·32

The figures given below are calculated on dry matter.

Ether extract	2·46	0·91	0·76
Albuminoids	10·50	7·35	12·46
Digestible Carbohydrates	73·32	89·49	81·41
Woody fibre	9·23	1·89	2·60
Ash	4·49	0·36	2·77
	100·00	100·00	100·00

Analytical figures of the grains of the staple crops of the Bombay Presidency are given below for comparison.

	Bajri.	Shalu Jwar	Rice.
	p. c.	p. c.	p. c.
Moisture	6 74	6·20	7·70

The figures given below are calculated on dry matters.

	Bajri.	Shalu Jwar	Rice.
Ether extract	6·00	0·69	1·13
Albuminoids	13·80	12·59	7·31
Digestible Carbohydrates	77·78	82·73	90 71
Woody fibre	0·54	2·29	0·05
Ash	1·88	1·70	0·80
	100·00	100·00	100·00

If the figures given above are compared one can see that the edible portions of the jackfruit in any of the forms used are fairly comparable with those of the staple crops namely Bajri, Jwar and rice of the Bombay Presidency ; hence the food value of the jack fruit is practically equal to that of the usual grains.

If the usual figures of analyses* for other grains and vegetables are compared, the food value of Jackfruit stands as follows.

It is decidedly superior to maize, millets like kodra, Vari, Nagli &c. and to vegetables of the cucurbit type (like red pumpkin, white Gourd, Padwal, Karla, Dodka) carrots, yams &c.

It is equal to the usual food grains like Bajri, Jwar, Rice and vegetables like onions, suran &c.

It is rather lower to grains like Wheat, peas, and pulses and to vegetables like Cabbage, Cauliflower, Knolkhol, Potatoes &c.

* Refer for actual figures of analyses of food grains and vegetables to Bulletin No. 124 of 1925, Department of Agriculture Bombay.

From the above data the importance of Jackfruit as a food material can be easily judged, and as a substitute to grains when needed.

In the hilly tracts of high rain fall this plant can grow practically wild and with due care it can be made to produce fruit abundantly even in famine days when the usual rice crop in those tracts fail. This friut is available throughout the dry season that is from April to July end.

In famine days specially in the hot season when the poor cultivators of the hilly tracts actually suffer from want of food, this fruit, being available then, can be safely used as the only food, being a substitute to grain, as it is equal in food value to the grains on which the people depend for their subsistance. It thus forms a boon to the people in times of necessity.

In lieu of the above facts it is urged that the cultivation of this plant should be increased as much as possible in every part of India wherever it can be grown as it will not only increase the profits from the land but will serve as a substitute to grain in days of famine.

SYNTHETIC FARM-YARD MANURE.

BY

N. V. KANITKAR, Esq. M. Ag., B. Sc.

Soil Physicist to Govt. of Bombay.

—○o○—

The importance and necessity of Farm-yard manure in Agricultural practice in any part of India is recognised by all Scientific workers and practical agriculturists. Its need and scarcity is more keenly felt in Irrigation Farming than in farming mostly dependent on rain. Under the conditions obtained in major parts of India dry decay of organic matter of the Soil goes on very rapidly under the hot sun. This loss of organic matter not only lowers the fertilty of the soils but more particularly spoils the physical properties of the Soil, which are essential for the proper growth of plants. The

evidence examined by the Royal Commission on Agriculture has led them to conclude that " the Soils of India have declined infertility to the lowest limit and that no further deterioration is likely to take place." They have also observed that "the most readily available supply of plant food is of course farm yard manure, but unfortunately a very large amount of this is lost to agriculture through the custom of using cowdung cakes for domestic fuel". On account of this loss of natural source of manure and also on account of the gradual increase in area under irrigation by the opening up of the new Canals, the deficiency of Farm-yard Manure is very keenly felt.

The Commission recommends amongst other things the investigation of possibilities of manufacturing Synthetic Farmyard manure.

The writer while acting as the Agricultural Chemist for a short period during the last hot weather got the opportunity of looking into the problem and the following information summarises the history and the present position of the Synthetic Farm Yard Manure and is given with a belief that it may be found useful and interesting to the readers of this Magazine.

During the period of the Great War, every country concentrated its attention in the maximum production of food crops. The increase in the amounts of food grains naturally resulted in the subsequent increase in the quantities of the straw as well, probably far in excess than could be utilised by the Cattle as fodder. Again it was recognised that these attempts at maximum production of food-grain naturally would result in lowering the fertility of the soils and unless they were compensated by the addition of some manures they were likely to be impoverished. These circumstances lead the research workers in England to take up the question of "how excess straw might best be used for manurial purposes." At the Rothamstead Experiment Station in England Dr. Hutchison carried on investigations "on the making of Farm Yard Manure without animals" from 1914 to 1919. In the Journal of Ministry of Agriculture the account of this work is given in two numbers of April and August 1919. In the first article on "the utilisation of straw Crop" it is pointed out briefly that effective rotting and disintegration of wheat straw have been found to occur (1) with free access of air, (2) Some source of soluble nitrogen is essential for the change. Urine urea, ammonium carbonate, and ammonium Sulphate could be employed for the purpose. (3) A certain concentration of nitrogen was necessary, the excess being lost if present.

In the second article in the August number of 1919 Dr. E. J. Russel has given an account of the investigations of Dr. Hutchinson. It is indicated that the breaking down of the material of straw the so called cellulose, is effected by a remarkable organism which had eluded all previous investigators, but which Dr. Hutchinson succeeded in obtaining in pure culture, so that he could study its properties. The organism requires (1) air and (2) soluble nitrogen compound as food. It ceases to act if either of these is missing. It merely attacks cellulose. The organism decomposes straw, breaking it down to form a black sticky material looking like farm yard manure.

A detailed article on " Artificial Farm-yard Manure " is contributed by Dr. Hutchinson and Mr. E. H. Richards of Rothamstead Experiment Station in August number of 1921, in the Journal of Ministry of Agriculture. It is pointed out that after a considerable number of preliminary experiments, promising results were obtained when straw was subjected to the action of a culture of aerobic cellulose-decomposing organism (i. e. Spirochaeta cytophaga). It is shown that the most essential factors influencing the production of well-rotted artificial farm-yard manure are (a) Supply of air, (b) suitable temperature and (c) suitable supply of soluble nitrogen compound. Most rapid breakdown of straw occurs when the reaction is either neutral or slightly alkaline. Ammonium sulphate alone makes the material markedly acid and hence fails to bring on rapid break down, while urine, urea, ammonium carbonate or peptone within certain limits bring on rapid decomposition. It is further shown that the quantity of available nitrogen should not exceed a definite amount. The amount of nitrogen necessary for pronounced rotting is 0. 70 to 0. 75 parts of Nitrogen for 100 parts of dry straw. The practical method based upon the investigations, suggest the use of three quarters of a hundredweight of ammonium sulphate and one of finely divided carbonate of lime for every ton of straw. The straw should be moistened with water for 2 or 3 days either in pits or heaps. When uniformly moist ammonium sulphate or calcium cyanamide is broadcasted on the surface and watered in, so as to allow soaking down of the dissolved material. When ammonium sulphate is used calcium carbonate is to be spread on separate layers of straw in the heap before soaking the ammonium sulphate with water.

Advantage of the above described researches was taken by the Agricultural Development Company in patenting a product called ADCO for the preparation of Synthetic Manure. The composition

of the material is not divulged. It is stated that the substance favours neutral or alkaline fermentation and the phosphate nitrogen ratio in the finished product is improved. Information about this process is given in the numbers of *Tropical Agriculture* of 1924 and 1925.

References to the above processes appeared in the Agricultural Journal of India in volumes XVII and XXI in 1922 and 1926 respectively. As a result, trials were made in India and especially in the Bombay Presidency for preparing Synthetic Farm Yard Manure. On the Poona Agricultural College Farm, the ADCO process was tried. All kinds of organic refuge on the farm was used with the ADCO mixture. Though a well decayed material was obtained, it was found that the process was too expensive and hence beyond any practical use. The Soil Physicist to the Government prepared in two successive seasons in 1925 and 1926 synthetic manure from Bajri straw using ammonium sulphate and calcium carbonate as the reagents to bring on the decomposition. In both cases a uniform material was obtained but again the cost was found to be heavy. Last year—1927 the Agricultural Chemist has prepared such artificial manure from plantain stems. The advantage of this material is that on account of its very high moisture content, the decomposition goes on very rapidly when some soluble nitrogenous compound even in smaller quantity is added to it. A further trial is being made in the present year and the results would be obtained in due course.

At Kumta Agricultural Station verious kinds of leaves from forest are being experimented with, for being converted into Synthetic Manure.

There are great possibilities for Synthetic Manure especially in irrigated areas, where there is increasing demand for bulky manure both for maintaining the fertility and tilth of the soil. The trash and megass of sugarcane, the weeds in the irrigated lands, leaves of trees especially near forest areas and all kinds of plant-products like the stalks of Cotton Tur, Groundnut husk and the like all can be utilised for the manufacture of Synthetic Manure. There is no difficulty in converting all these substances successfully into manure. The only question is with regard to the cost at which we can produce the manure. The use of ammonium sulphate and chalk increases the cost of the artificial product. If some cheaper source of soluble nitrogen is used the cost may be appreciably reduced. The use of cattle-urine which is not being used by a majority of farmers would at once reduce the cost of production. Again the experiments in

Bengal have shown the possibility of using the cow-dung diluted with water as a source of nitrogen. The Agricultural Chemist and the Deputy Director of Agriculture, S. C. D. are going to carry out an experiment on an economic basis in the coming season.

To these sources of Nitrogen the writer would like to suggest the use of sewage water as a source of soluble nitrogen. The nitrogen in this would not only be readily available but would be found very cheap as well. Experiment should be made with this material and if successful results are obtained it would at least solve the problem of Farm yard Manure in the whole of the tract where sewage water is given along with irrigation.

LAWNS FOR SPORTS, THEIR CONSTRUCTION AND UPKEEP

By

S. R. GODBOLE, B. Ag., B. Sc.

Asst. Economic Botanist, Agricultural College, Poona.

The advent of the rains marks a great stir among all classes of people from the toiling cultivator up to the pleasure seeking sportsman. To the former it is a grim game while to the latter the question is one of getting the most out of his favourite sport. It is well known that a perfect lawn constitutes one of the conditions for an ideal game in Cricket, Polo, Golf, Tennis etc.

Here I have tried to give briefly some hints regarding the making and upkeep of lawns. The principle of making and aftercare of such lawns is practically the same for all these games. For the game of polo the perfect evenness is not a very important point while with other games it is essential to have a smooth and even surface. I shall therefore take as an instance the lawn for a cricket pitch as cricket is a game which is most popular with the middle class as well as the rich people, while games such, as golf, lawn tennis, polo etc. are within the easy reach of only a few rich men,

1 *Construction of lawns* :—Under this three important points should be noted.

(1) Soil and its preparation (2) grass used for lawns (3) actual laying out.

(1) *Soil* required for lawn should be such as would give a good stand of grass and it should neither crumble in hot weather nor become sticky and soft during the rains. In short it should be a stiff lawn. Such a type of soil is available along the sides of rivers, big nallas and tanks ; failing these the soil from the field embankments can also be utilised.

Preparing the grounds :—In the case of ground with well-drained subsoil, dig out earth for 9 to 12 inches deep and then fill this ditch with fine loam. (Fig I) In the case of deep clay soils dig

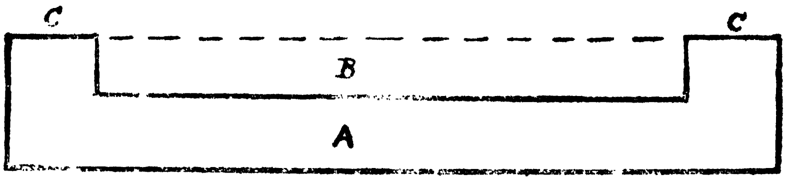


Fig. I.

out earth up to about 2 feet and then at the bottom of ditch lay a system of 3 inch drains about 10 yards apart and over it put a layer, 12 inches thick, of broken bricks and roll it until it becomes quite hard and level. Fill the remaining portion of the ditch with fine loam if available or with the removed earth mixed up with fine sand and well rotted dung (Fg. II). It is preferable to heat this

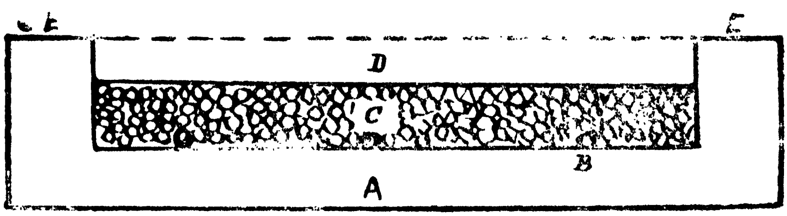


Fig. II.

loam or mixture of soil-put as a top layer-on a very slow fuse made from any garden or stable refuse. This heating destroys the tubers of *Cyperus rotunds* (lavala) a very common and most trouble-some weed and also the seeds of other rank vegetation.

5

In both these cases roll and level the soil most thoroughly so as to make the surface quite firm and true. Give a slight slope- 1 in 100-on one side so as to facilitate draining of the surface water.

(2) *Grass to be used for lawns* :--The game of cricket requires a perfectly even and smooth surface so as to give the ball an easy run; in order to give this effect the grass to be used must be of trailing habit, with vigorous growth and not growing high. If the first two qualities are absent in the grass the pitch will not be covered evenly; and if the grass grows high the players will have no command over the ball but the ball will be at the mercy of the ground due to high standing grass shoots obstructing it. The best grass for such lawns-fulfilling all these qualities-is *Cynodon dactylon* commonly known as hariali or doob-grass. This grass has a trailing habit, roots at the nodes and holds the ground firmly.

(3) *Laying out the lawn* :—The lawns can be prepared either by sowing seeds or planting sets. The sowing method requires less labour and time but it takes a very long period—more than a year in favourable conditions—to get the whole ground covered up so as to make it perfectly playable.

The ground to be sown is first divided into small squares and then the seed is broadcasted in each square evenly and carefully one to one and half ounce of seed is quite sufficient tor 1 sq. yard of ground. Hariali seed that is offered in market has got good germination percentage and can safely be used.

If the expense is no question and if the turf is required for play within a short time the planting of sets should be resorted to. (On the Poona Gymkhana cricket pitch grass sets were planted in the month of February 1924 and the pitch was perfectly ready for play in June 1924).

There are three ways of planting sets:—

(*a*) Pull out a quantity of Hariali by roots, cut it into fine pieces, mix these well with rather thick mud and spread this mixture thinly and uniformly over the piece of ground prepared.

(*b*) Dig up Hariali in squares of about 9′ (from the places where it is found) with soil sticking to the roots and lay these pieces on the ground in the way tiles are used for paving. Water the ground thorougly before laying these squares. Then beat these with a

wooden mallet (चोपणं) (Fig III) until an even and firm surface is obtained.

Fig. III.

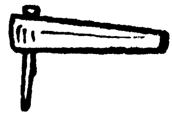


Fig IV.

(*c*) Cut hariali into small pieces of about 2 inches length and plant these into the holes made in the ground 3 inches apart each way. The holes can be made very quickly and efficiently by a very simple instrument having a wooden handle and a thick nail at one end (Fig IV).

(This method was resorted to when I got prepared the Cricket turf of the Poona Gymkhana in 1924).

After planting water the ground thoroughly. Watering should be done practically every day (especially in hot and dry days.) to keep the ground moist. Grass takes hold within a week and begins to thrive. Roll this repeatedly with a light roller when the soil is not too dry nor too wet : Rolling presses down the growing shoots which take hold in the ground by rooting at the nodes and in this way ground is covered up soon.

If still more quick and vigorous growth is required give top-dressing of Amonnium Sulphate after hariali shows a good start in growth. This top-dressing can be given in two ways :—

(1) Mix up the required quantity of Am. Sulphate (½ to ¾ of an oz. is quite sufficient for 1 sq. yard.) with four times its bulk of Road dust or fine sand and then spread it carefully on the lawn. (In this method utmost care is required in spreading the mixture evenly or otherwise the grass is likely to be burned where there is a thick layer dropped.)

(2) Take half the quantity of Am. Sulphate required, dissolve it in water and sprinkle the solution on the lawn with a sprinkling can swinging the can from right to left. Take the other half and do the sprinkling cross ways. After topdressing in either of the ways water the ground thoroughly.

II *Upkeep*—Under this head five important points should be noted.

1. Watering, 2. Weeding, 3. Mowing and rolling, 4. Destroying earth-worms, 5 Renovating.

Watering:—This will depend upon the climatic conditions of the place. The chief thing to be borne in mind is not to allow the grasses to dry out. This has to be particularly taken care of during hot days when watering is necessary practically every day. The best time for watering is in evening as it reduces evaporation and thorough soaking, and watering should be done by hoses or sprinklers with fine sprays to insure less damage and uniform spread of water.

Weeding:—One of the most important operations in the upkeep of such lawns is exterminating weeds appearing along with the lawn-grass. These weeds infest the lawns very often, and by their tall and vigorous growth smother and kill hariali. These have to be taken out, as soon as they make their appearance, not minding the expense. Economy made in neglecting the weeds is no economy as the cost of renovating such lawns is much more than the cost of weeding.

Weeds commonly found in lawns are *oxalis corniculata, Linn Euphorbea pipulifera Linn, Euphorbea thymifolia*; *Burm, Eragrostis sp, Andrpogon pertusus willd* and *Cyperus rotunduś Linn*; of all these the last one is the most troublesome as it propagates by underground tubers.

But of the three ways of laying just mentioned above in (*a*) and (*c*) pure hariali can be sorted out and so there is much less chance of weeds. In (*b*) there is more possibility of weeds as no sorting is possible due to hariali being removed in squares and paved.

Mowing and rolling :—It is a clear fact that if grasses are closely grazed or cut the strength of plants is thrown back to the roots which form a dense net underground and give out many tillers, where there were a few ; on other hand if they are not grazed or cut they grow high. So close and regular mowing with a suitable mower is absolutely essential to accelerate tillering, keep down the standing heads and thus make the surface even and smooth. There are two types of mowers manufactured by "Ransomes" with gear and chain driving arrangements, and having widths of cut varying from 12 to 24 inches. The gear driven one requires fewer adjustments than the chain one but the latter is easier to work and gives the best results. For small areas such a type of machine should be used.

Rolling is necessary in order to keep the surface of the turf smooth and firm. The ground should not be rolled when it is too

wet or too dry. Rolling should be done with a fairly heavy roller and it should be done not only in one direction but even cross ways.

Destroying Earth worms (*Pheretima posthuma*). Though earth worms are regarded as a beneficial factor in soil making they are a nuisance to the lawns and should be removed. These can be destroyed in two ways. *a* by sprinkling a solution of corrosive sublimate (2 ozs, to 50 gallons of water) followed by thorough watering. *b*, by giving a dressing of mowrah (*Bassia latifolina*) seed cake (15 lbs. for 1000 sq. yards.) followed by thorough watering.

Renovating :—The lawns along with the soil get exhausted after some years due to the wear and tear by the players and the plants finishing up the plant food more quickly when they make effort to recover and produce new shoots after each mowing. To remedy this lawns should be given dressing of Am. Sulphate mixed up with fine alluvial soil four to five times or even more its own bulk. The surface of the lawn should be first loosened by means of a rake and then the dressing should be given. These operations should be followed by light rolling and thorough watering.

From all this it is clear that the upkeep of such lawns requires money and close attention. It is a false economy to forego any of the operations mentioned above just because the initial outlay is large.

SELECTION FROM PUSA 4 WHEAT AT DOHAD FARM IN NORTH-EAST GUJERAT.

BY

P. R. DESAI, Esq., L. Ag.

Superintendent, Dohad Farm

The Panchmahals District in Gujerat grows a good crop of wheat principally in two of its talukas-the Dohad and the Jhalod and the acreage in the District may be estimated at about 30000. The soil being brown loam is highly retentive of moisture and facilitates of irrigation obtain from tanks, wells or small streams of which there are many there. The winter is very very cold. Generally two crops are realised every year and of these, wheat is by far the most important winter crop. It however suffers from the attack of rust very badly on account of the cold moist characters of the climate referred to above, especially when cloudy season lasts for a longer period during the winter season. Consequently the problem of obtaining rust resistant types of wheats was taken up on the Dohad Farm and efforts were made to solve it by hybridisation and by bringing in known rust resistant wheats. The wheats isolated by A. E. Howard, Economic Botanist to the Government of India at Pusa known as *Pusa wheats* were given a trial and out of them the Pusa 4 was found to be better suited to the local conditions than any other. Consequently, the same was further distruibuted in the tract and can be said to occupy by this time more than about 30-40 p. c. of the total wheat area. It has to be admitted that it is an early-ripening wheat which gives a fairly high yield being particularly resistant to rust attack. Even the grain has a qualitative superiority. It had certain defects and particularly those that have a relation with its absence of awns, its tough straw, its slenderness during its early stage but they are very minor and may be passed over.

The original seed of Pusa 4 and Pusa 12 wheats was brought from Pusa in the year 1913–14 and again in 1918–19 and 1919–20 and the types have been grown separately under careful conditions ever since. As a part of the scheme of the destribution of pure seed of Pusa 4 the farm maintains plots of it increasing the seed every year and efforts are made to see that the crop contains no admixtures of any sort. In the year 1921–22 however, while observing the earheads of Pusa 4 in the course of making an effort to rogue out any chance admixtures, the earhead of Pusa 4 did not look all alike. To varify this passing doubt, panicles were isolated that were found to differ from each other in respect of certain characters like the hairiness on glumes, the shape and size of the spike &c. &c. The progeny of these had been grown in separate line cultures and on the basis of higher yielding capacity further selection from these cultures was made. During 1924–25, one culture out of these was found to be early and better yielder and its seed was multiplied during 1925–26. In the meanwhile a fresh stock of Pusa 4 wheat was obtained from Pusa in order just to make sure that the farm seed was not impure on account of what may be called careless handling. It may however be stated that Pusa 4 even as directly obtained from Pusa was not much different from what it was on the Dohad Farm and hence the study of the selections was continued. Of these selections worthy of attention was the progeny of these plants that are mentioned below in comparison with the unselected Pusa 4.

Table showing the behaviour of selections from Pusa 4.

Yield in lbs. from 50 sq. ft. area.

Name of Culture.	1923–24	1924–25	1925–26	1926–27	1927–28	Average.
Pusa 4–10	2	2	$2\frac{1}{10}$	$2\frac{1}{5}$	1	$1\frac{9}{16}$
Pusa 4–7	$2\frac{1}{8}$	$2\frac{1}{4}$	$2\frac{4}{5}$	$2\frac{1}{2}$	$1\frac{1}{4}$	2
Pusa 4–3	$2\frac{1}{4}$	$1\frac{1}{2}$	$2\frac{1}{10}$	$2\frac{1}{5}$	$1\frac{1}{4}$	$1\frac{3}{4}$

During 1927–28 these were grown in lines on an area of 25 sq ft. only.

From the above data it could be seen that selection No. 7 from Pusa 4 had a better yielding capacity than other selections. Subsequently it was compared with the unselected Pusa 4 on an area extending over 13 Gunthas.

Table showing comparative behaviour of Pusa 4 unselected and selected No. P. 4–7 (observations are recorded from 20 plants from each).

Character	Unselected Pusa 4		Selected Pusa 4	
	Range	average	Range	average
1 Tillering ...	5 to 14	11–6	7 to 17	12–6
2 Plant height ...	2′–1″ to 3′–2″	2′–8″	2′–9″ to 3′–6″	2′–11″
3 Panicle length ...	3″ to 4″	3·6″	3–5″ to 4′–5′	4″–0
4 No. of spikelets ...	14 to 18	16·3	17 to 20	18–9
5 Date of flowering ...	4–2–28 to 14 2–28		24–1–28 to 2 2·28	
6 Per plant Yield ...	Tolas Tolas $1\frac{1}{2}$ to $2\frac{1}{2}$	Tolas $1\,^{3}/_{4}$	Tolas Tolas $1\frac{1}{2}$ to $3\frac{7}{8}$	Tolas 2
7 No. of grains per Tola. ...	125 to 141	131	115 to 125	121
8 No. of abortive spikelets per panicle.	2 to 3	2·1	1 to 2	1·9

Besides these comparative figures for several characters it may be observed that the earnheads of Pusa 4 P. 7 when grown under dry conditions are slightly tapering at their end; whereas in a majority of cases in Pusa 4, they are square, congested at the top and hence flattened out or bulging. Besides, ear heads in the case of Pusa 4–7 are observed to slightly droop at their upper end, as they reach maturity. The glumes are felted in the case of Pusa 4–7 where as in the case of Pusa 4 they are not necessarily so. Pusa 4–7 shows an uniform ripening. Pusa 4 unselected shows occasional presence of awns of varying length while Pusa 4–7 has got no awns. Lastly it may be pointed out that the stem in both the cases is as hard and resistant to lodging or attack of the stem-borer pest and there is the same resistance to rust in both.

The Field trials of both the selected and unselected types were continued through three years with the following results.

Table giving results of Yield of Pusa 4–7.

Competing Types.	Yield in lbs.			
	1925–26	1926–27	1927–28	Average.
Pusa 4	1392	1053	1320	1255
Pusa 4 P–7	1632	1200	1456	1429

These figures indicate that selection P. 4–7 can give about 13 p. c. better yield than the unselected Pusa 4 besides being a much earlier than that. It has all other merits of Pusa 4 and hence may prove a very useful selection for the tract.

The stock of the seed on hand of this is about 259 lbs. and before declaring the final result and distributing the seed to the cultivators it is proposed to try it next year and to compare it more closely with Pusa 4 so as to get a further confirmation of these results.

6

CECIDOMYIAD FLY PESTS OF THE MANGO.

By

P. V. WAGLE, M. Ag.

Mango Investigator, Ratnagiri

This group of small mosquito-like flies has been recently coming into prominence on account of the fairly large number of pests coming under this family. They are characterised by the gall-like formations on different parts of the plants affected by them, particularly the flowers and fruits. Typical examples of these may be found in the Rice-gall midge (Pachydiplosis oryzae). *Jawr*, *Bajri* and *Vari*—cecidomyiads and the sesamum gall fly. The mango shoots, flowerhead and flowers have also been noted to be affected by these flies of which there appear to be three distinct species as can be made out from their habits and method of attack. These, however, have not yet been idenified. They can be described as follows :—

Sp. 1. This attacks the fresh vegetative shoots and the *rachis* of the early flowerheads in November and December only. The flowerheads which appear later on are free from their troubles. The eggs appear to be thrust into the tissues and the maggots which hatch out feed inside. They are first whitish in colour but when fully developed turn yellow. When full-fed they drop out into the soil and pupate. The affected tissues dry up and black spots with a small hole at the centre can be seen all along the axis of the flower-head or the vegetative shoot. Consequently the tender leaves of the shoots and the small branches of the flowerheads dry up and shed. In bad cases of attack the whole shoot or the flowerhead is completely killed. Thus a very large number of the early flower-heads in November is destroyed almost every year. While of those that appear in December and early January several branches dry and drop off. We could count nearly 50 such branches drying and prematurely shedding from 20 flowerheads ; while those in February and March lost none of them. This will give an idea as to how harmful this pest is.

A few attempts at controlling this pest were also made. The maggots are able to jump long distances and they are particularly attracted to water. If a basin containing water is kept below an affected tree a number of the maggots are found to jump into the water and are thus caught. How far this would be practicable and effective on a large scale is yet to be seen.

Attempts were also made to see if they could be attracted to the fermenting juice of sugarcane, but these flies were not attracted.

They were also not attracted to light traps.

Sp. 2. The flies of this species attack the mango flowers in the bud stage. The affected buds assume a round and much thicker appearance than the normal ones. From a distance they might be easily mistaken for small fruits. In grafted mangoes only isolated buds are affected in this way but in country mangoes sometimes the whole flowerheads are affected. The floral parts become thick and are all fused together to form the ball-like structure. If one of these is cut open, several small maggots will drop out from the centre where they remain and feed. They are first whitish in colour but later on turn pink. The affected buds are never found to open but drop off after some time. This disease causing the malformation of flowers is locally known as 'Doda.'

Sp. 3. This species also affects the flowerbuds of the mango, especially the grafted ones. This pest is found throughout the season but is particularly bad on the flower heads in February and March. A number of flowerbuds in each flower head are attacked. The affected flowerbuds can be easily distinguished from the rest from their bigger size and slightly round appearnce. These buds are never found to bloom. On spliting them open, several yellow maggots can be seen inside. They feed on the thick fleshy disc inside the flower, on which the ovary is situated, with the result the ovary does not develop at all. Unlike the former two, this species pupates in the bud itself. The pupal molt can be often seen sticking up from the tip of the bud. After a time the bud dries up and sheds. Of all the three species, so far as the present observations go the first one is the most harmful.

A REVIEW.

———:o:———

MANUAL OF DAIRY FARMING.

Dairying as practised by Gowalis can be described as, keeping some cows and buffaloes and especially the latter in larger number' milking them and selling milk which is seldom unadulterated. Whatever surplus milk remains, is converted into curds which is churned and butter is extracted. So milk, butter, curds and butter-milk are the products that are dealt with, no matter whether they are raised economically or uneconomically. The persons who practise this business hereditarily are konwn as Gowalis. But nowadays other people also have begun the business of selling milk and milk products. Without the least intention of belittling any body we venture to say that there are very few who are running their concerns economically and on scientific lines. Dairy business as practised in other countries is run on scentific lines. The conditions prevalent there might be different from those obtained here; still it must be admitted on all hands that to start a Dairy concern and to run it on economic and scientific lines one must be thoroughly conversant with up to date knowledge and methods. There is a lot of literature in western countries giving all such necessary information but there are very few books in India which deal with this subject taking into consideration our Indian conditions. That deficiency has been to a great extent removed by the treatise under review by Mr. B. K Ghare, L. Ag. This manual describes the subject in five parts such as-1 Rudiments of Agriculture, II Cattle Management, III Milk and its Products, IV Cattle Breeding and V Dairy and its Economics. Out of these chapters II, III and V are the most important ones. These chapters give information regarding the care about the dairy animals, care about the products and care about the concern. Mr. Ghare's treatment of the subject is very systematic and the whole book is written in a very simple and lucid style.

The chief peculiarity about the book is that he has treated the subject taking into consideration the Indian conditions while dealing with breeds, their feeds and feeding &c. In short Mr. Ghare's book is a valuable contribution to the already meagre literature on this subject and Mr. Ghare has certainly to be congratulated on

this production. Not only it will serve as a text book for students in Agricultural Colleges in India, but will greatly be useful as a guide to those wishing to start Dairy farming. We wish every success to this book. The book covers about 300 pages and its price is Rs. three. It can be had of messrs Macmillan and Co. Bombay. (V. G. D.)

PHYSICAL CULTURE.

:o:

Good physic is a covetable thing and *a sine quinon* for a healthy life. It is a natural gift in the case of some, but those not so gifted can obtain it by regular culture. Exercise, may it be of any kind, is necessary for the normal functions of the whole body and in its absence different parts of the body are not brought into full action; digestion is in the first intance stifled with and makes the way smooth for the creeping of various diseases. Athletes devote all their attention to build up their body-physic, but that is not the aim of each and everybody ·in life, still a healthy body is necessary for leading a happy and cheerful life.

There are various games and plays which cause some kind of exercise, but that may not tend to the building of good physic. To attain that every growing individual must undergo some kind of regular, systematic and scientific exercise. There are different systems of exercises indigenous and foreign and the aim of the present book under review is to interpret the old traditional exercises practised in the gymnasia in terms of modern science and language. This small treatise written by Prof L. B. Bhopatkar explains the subject scientifically. To know the smooth working of a machine one must be thoroughly aquainted with the component parts which go to form the machine. So he explains the body and its structure and also the physiology of it. Then he deals with the basic principles underlying the different exercises described in this book. Lastly he describes the various exercises and how they are useful for and suited to develop the different divisions of the human body. At the end he gives some hints about the Dietics which may be carefully gone through. He explains there as to what the human body is made up of and what should be the food to

produce the necessary heat and replace the waste of the energy expended by the body in doing different works. He gives the analysis of Vegetarian foods and suggestions to supplement them to make them complete foods with a view to supply all the important and necessary elements the human body is composed of.

In short this treatise will serve as a very useful guide to a physical culturist and its utility will be greatly enhanced by its being profusely illustrated explaining the different positions in taking different exercises. We repeat an apt quotation from the book—"By exercise a consciousness of increased power is acquired which in him begets self-confidence, resolution and courage qualities. These, if rightly directed by proper moral and intellectual training, elevate the tone of the entire character and aid to an important degree in subduing passions" and ask every physical culturist to bear it in mind and to realise its importance. (V. G. D.)

A FIGHT BETWEEN PRINCIPLE AND PRESTIGE.

"*All well that ends well*" said Hon. Mr. V. J. Patel when he was interviewed in connection with the Bardoli-settlement—wherein as every news-paper-reader is aware a question of principle and prestige was involved and a tug-of-war was going on between two parties apparently unequal in strength—Poor Peasantry of Bardoli on one hand and All Powerful Government on the other. Both the parties thought that they were standing on a firm ground. The cause for the fight originated as follow :—Revision settlement for the Bardoli Taluka was ordered by Government to be made. The settlement officer submitted his report that the present assessment might be increased by 30 p. c. The report was scrutinised by Government and the increase was commuted to 20 p. c. The people of Bardoli petitioned to Government that the increased was not just as it was not supported by facts and figures and that a fresh inquiry might be instituted. Government disregarded it and orders were issued to collect revenue at the exhanced rate. People refused to pay the increase. The authorities began to use force. People were unamious and determined not to pay till this simple grievance was addressed. Government were on the contrary determind to collect the revenue from the people by using all force and power and to punish them for breaking the law and challenging the authority. People were organised, adament in their resolution unmindful of the consequences as they thought that it

was legitimate on their part to appeal to Government for getting their grievance redressed and if the appeal was not heard to start Civil Disobedience. Thus the fight began. Government began to attach the properties, confiscated and auctioned the lands of those who refused to pay the increased assessment. People did not swerve an inch from their vow of non-violence and boldly faced any calamity that befell them. They showed exemplery discipline, and organisation under the leadership of one man—Sardar Vallabhbhai Patel. Both sides began to try their strength. People suffered, but were determined to stick to their principle of asserting their own right of an inquiry and Government cared for their prestige and insisted on the payment first. The fight as it prolonged, did not remain a local problem. The popular cause was morally and actively supported not only in the presidency but all over India and even abroad. But all the while there was an internal desire for compromise on both sides. When the Government thought that the movement assumed importance beyond proportion, His Excellency gave an ultimatum to the people and Representatives of Bardoli to settle the question once for all or to be ready to suffer all consequences. He at the same time laid down his conditions on which Government were ready for compromise. Leaders and Prominent people anxious for a compromise consulted the Sardar of Bardoli and the Bardoli people. One Mr. Bhat—a rich man from Bardoli offered to pay the excess or the increased assessment and this saved the prestige of Government. Government on their part ordered a fresh inquiry to be held meaning thereby that the principle of the people was accepted. Thus happily ended the Bardoli struggle and the question was amicably and honourably settled.

COLLEGE NEWS AND NOTES.

—():o:()—

Our Debating Society:—Under the management of our enthusiastic secretaries we had the first opening lecture on Cooperative Credit by Mr. Bhide I. C. S. under the Presidentship of Rao Bahadur P. C. Patil. The lecturer in the light of his experience as Registrar of Cooperative Societies, demonstrated with facts how the Cooperative movement in Bombay, inspite of resources, could not make any rapid progress due to adverse conditions of famine, pressure of population on land, lack of industry and education and inadequate return from

agriculture, not to speak of the compulsory evils of assessment and social functions. While the recovery of the over-dues in lakhs from several districts is a serious problem on the one hand, finding utility for the surplus resources waiting to be invested on agricultural credit at a very reasonable rate on the other hand is a problem still more baffling. Inspite of a surplus of 40 lakhs lying idle, the condition of the business side of Agriculture is stagnant for lack of a few clever people to utilise these resources. The economic forces are to be tackled only by obeying the laws of Economics as we combat the forces of nature in Physics and Chemistry in obedience to the laws.

The President remarked on the necessity of grappling with the situation inspite of all adverse conditions, from the point of view of welfare of the masses, irrespective of any remuneration. The remedy would be education and improvement of social conditions. The eradication of moral and social evils must necessarily precede the inauguration of a responsible and organised body.

We are indeed fortunate in having the new Imperial Meteriological Buildings adjacent to our College, a healthy neighbour to an Agricultural Institution. Rao Saheb Wnakar gave us a lantern lecture on Forecasting the precipation in India from the nature of the many and varied kinds of moisture-laden winds as they traverse from place to place hovering across expansive sheets of water and land.

We had another lecture by Rev. Father Elvin on "What the West has to learn from the East" in the course of which he expatiated at length on the four great virtues of the East especially India-the simplicity of life, the habit of detachment, the ideal of Brahma charya and above all the spirit of Renunciation as opposed to temporalities of the West. He found examples for these virtues in Mahatma Gandhi, Ramakrishna Paramhamsa, Swami Vivekanad Sadhu Sundarsing, Dr. Tagore and others to mention only a few.

Rao Bahadur Sahasrabuddhe, the president gave a finishing touch to the bright picture by giving it proper shady background, echoing the sentiment of the poet who sang.

"East is East and West is West
The twain can never meet"

If the West is to learn these virtues from us, we have to learn from the west the political and economic structure.

Last week we had a talk on Arbor Day. Prof. L. B. Kulkarny traced the universal appeal, the Tree Day has made in these fifty years. State after State has taken to celebrating the Day. Newton's Groove, Washington's Avenue and the like are familiar instances. Recently Persia, China, Japan and other Countries too are celebrating the Day. To inculcate the lesson of planting every school boy and girl should be made to plant at least one tree each. Tree planting adds humus to the soil, and improves it and also gives water and increases sub-soil moisture. Trees also keep the Climate cool. Along with planting a systematic principle in cutting trees should be observed, each removal giving place to the planting of a new one in its place.

Dr. Cheema the president remarked that tree-planting is a matter of national importance. It is essential for the fertility of soil and for improving the climate; but we cannot afford to have any more forests to welcome animals who do much damage to our crops. Some trees must be cut, so that tree planting is useful only when it is done in a judicious manner. The best way is to grow fruit trees which are well taken care of and therefore do not harbour animals.

The various departments of the Gymkhana are in full swing; but a cloud seems to have passed over the usual enthusiasm and buoyancy of spirit that was prevailing in us. Perhaps the shock of the last examination results is still lurking. Our studies seem to demand an undue share of our energy. One is half inclined to ascribe it to the unwieldy nature of our course comprising over a dozen subjects of numerous statistical details.

Time and tide wait for none but both seem to 'fly away' from us—Agricultural College students. Time seems to have apportioned for us only two days in a week. One never notices the flight of time from Monday morning till Saturday evening of the Week; and the short Sunday is as restive as it is pensive, so much so nothing remains to complete our realisation of the value of Time on the one hand and the dignity of labour on the other.

We lost in our first tie in the David Cup Cricket Tournaments against the Fergusson College. Our cricketiers showed a real spirit of Sportsmanship and played the game to the last most cheerfully.

The Reading room has been made more attractive and it is always crowded with the lovers of newspapers. Other sections of the Gymkhana also are working in full vigour.

The Inter collegiate sports would be held in the month of September and our representatives are putting in good practice, we hope to retain the honour which we have won last year.

Our Social Gathering and Sports used to give us much relief from the pressure of work of the first term. Fortunately or unfortunately that Ceremony also has been postponed to the next term. Our College sports, however, were conducted in this term which indeed kept us in Mirth and Joy for a fortnight. We congratulate the prize winners and particularly Mr. Marwadi, the General Champion, who has been able to Score several points to his credit against heavy odds. We also tender our thanks to the members of the staff who graced the occasion by their presence. Rao Bahadur P. C. Patil, Prof. Gokhale, Messrs. Vasvada and Advani deserve our special thanks for having acted as Judges

We are extremely glad to hear that Messrs Joshi, Phadnis and Gadre from the Poona U. T. C. have been given the King's Comission in the Army Reserves. The first two Gentlemen belong to the other Colleges, while Mr. Gadre belongs to our College and is the Senior of the three. We offer our hearty congratulations to them and wish them a very happy and bright career.

Mr. M. D. Patel, an old Boy of our College, has left Ithaca, New york University, last week, to Wisconsin to study for the Ph. D. degree. Creditably passing out from our College in March 1927 he proceeded to U. S. A. in July 1927 and took his M. Sc. degree (Ithaca) last June 1928. We wish him a bright career at Wisconsin.

THE FARMER'S TRANCE.

1

My farm is sure a lovesome spot ;
With palm and jack and mango trees.
And many a fearful fairy grat :—
What luck ! the barn does still in crease.

2

The placid river round it flows ;
Inspiring me with much delight
And here the south-west monsoon blows ;
In all its force and panting fright.

3

The pigeons coo, the thrushes sing ;
At morn from shady branches high
And round my little cottage sing
Sweet notes of music from the sky.

4

Calves join with kids in jolly dance ;
When Phoelms to his western home
Resigns and I in lover's trance ;
With lassie mine in joy do roam.

By:—E. P. Buell

✓ Department of Agriculture

LEAFLET No. 16 OF 1927

Maize Silage in the Gokak Canal Area

Maize is extensively grown in the Gokak Canal Tract, both as a *kharif* and as a *rabi* crop. The average area under this crop is 6,000 acres. Maize straw (*kadbi*) is the principal fodder for the cattle of the canal villages and the bulk of it comes from the *kharif* crop. This *kharif kadbi* is usually thick and coarse in quality and is often damaged by rain at the time of harvest in the latter half of September. The material has to be dried before stacking and during this drying it is often very badly spoiled by rain. The *kadbi* which is really thick and coarse is then very little relished by the cattle. About fifty per cent. is wasted while feeding, and that which is eaten is also very poor in feeding value. In the hot weather from May to June the cattle have to subsist mainly on this dry coarse fodder and their condition considerably falls off. No fresh green fodder is available at this season and the supply of a more nutritious fodder during the hot weather is an important problem of the Gokak Canal tract.

Attempts were made from the year 1913-14 to 1919-20 on the Gokak Canal Farm to cut *kharif* maize in its milk stage without removing the cobs and prepare silage from it. The method was not, however, liked and adopted by the cultivators, because they had to lose a crop for the sake of the fodder.

From the year 1921-22 a different system has been employed. The cobs were removed and the succulent semi-dry *kadbi* was turned into silage. This gave very satisfactory results and the method is still being continued. The silage so prepared has proved to be an excellent fodder, both by analysis and by its effect on the animals.

Method of preparing Maize Silage

Silo-pit.—A *pacca* pit is more economical than a *kacha* one. The dimensions may vary according to the quantity to be filled in. A two-bullock cultivator generally grows two acres of maize and a pit nine feet deep with eight feet diameter is convenient. The dimensions of the pit suited to a four-bullock cultivator would be ten feet in diameter and twelve feet deep. It is advisable to construct a pit two-thirds below and one-third above the ground.

Harvesting and filling in.—The cobs when fully developed should be removed from the green plants which should then be immediately harvested, chaffed and filled into the silo-pit. On no account should the plants be allowed to dry. The rains during September will help the operation.

Removing cobs, harvesting maize plants, chaffing and filling in should follow one another immediately for successful silo-making. An ordinary lever chaff cutter will serve the purpose of cutting the *kadbi* to be filled in, though a bullock gear or power circular chaff cutter is more desirable, when large quantities are to be dealt with. The pit may be filled in slowly within a week, in which case the stuff prepared will be sweet silage. Sour silage can be prepared by filling in the pit rapidly in a day or two; but it is not liked by cattle as much as sweet silage and the operation too is difficult. Other points to be remembered for successful silo-making are:—

(1) As the stuff is filled in, it should be well trampled, specially along the wall of the pit.

(2) The operation of filling in should be continued up to two feet *above* the mouth of the pit, so that the stuff after settling will come to the proper level.

(3) After filling in the stuff and allowing it to settle for a day it should be covered by some roughage, weighted with stones and the upper surface well plastered with mud and cowdung mixed together. If there be any cracks after plastering (which do occur in course of time) they should be repaired and the pit always kept air-tight.

(4) The pit should have a temporary shed over it against rains.

The silage thus prepared may be fed to cattle in the hot weather with advantage, when green fodder is not available. The required quantity per day should be removed in even layers. On the experience gained on the Gokak Farm wastage at the top, bottom and sides may be estimated to come to about 10 per cent. There is practically no wastage in actual feeding. Cattle relish and eat all that is fed. Care should be taken to give not more than 20 lbs. per head per day in the case of adult animals and comparatively less in other cases.

If all cultivators make use of maize fodder in the form of silage as described above, the quality of the fodder supply and the condition of cattle in the canal tract are likely to improve without much additional trouble or cost except building silo-pits. A pit suited to a two-bullock cultivator may cost Rs. 150, while that for a four-bullock cultivator Rs. 200. If the cultivator brings or has his own stones for building, the cost will be considerably less. Preparing silage is more economical than turning *kharif* maize fodder into dry *kadbi* and should attract the attention of all the cultivators in the canal tract.

Any more information required on the subject may be obtained from the Superintendent, Gokak Canal Farm, Post Arbhavi, District Belgaum.

Department of Agriculture, Bombay

LEAFLET No. 21 OF 1927

Cultivation of *Spanish Peanut* Groundnuts in Khandesh

"Spanish Peanut" groundnut has been valued very much on account of its high oil content. This variety is grown in the Khandesh Districts, and Khandesh groundnuts have a very good reputation in the eyes of the Bombay groundnut dealers. Owing to various causes, and to demonstrations carried out over a series of years the area under this crop has very greatly increased and this type of groundnut is now almost exclusively grown in Khandesh. The following figures will give clearly an idea regarding the increase of the crop and its present extent :—

Year.		Area under groundnuts.
		Acres.
1913-14	...	6,137
1925-26	...	297,206

The area in the year 1925-26 represents nine per cent. of the cropped area in Khandesh. Its cultivation has not benefited only the cultivators but also the labour and trade. The main advantages derived from this crop are as under :—

(1) The crop is entirely a rain crop.

(2) It could be grown even on lighter soils.

(3) It ripens in three and a half months.

(4) It is a money crop ; it has given the cultivators an opportunity to grow a crop worth Rs. 100 in place of one worth Rs. 40-50 per acre.

(5) It is a good rotation crop to cotton particularly in Khandesh.

(6) It provides nutricious fodder for cattle.

On the other hand, it is to be stated that along with the increase in area under groundnuts, there has been considerable increase in its harvesting charges. These charges come to Rs. 12 to 15 per acre which represents one-sixth of the total value of the crop. The Agricultural Department is conducting trials to reduce the cost of harvesting, and some recommendations will shortly be put forward. The crop

should not be continuously grown on the same fields year after year.

Pre-tillage.—After the harvest of cotton, the cotton stalks are removed by giving two or three harrowings to the land. In the case of lighter soils, ploughing, preferably with a mould board plough, is recommended before harrowings. Very little manure is given to the groundnut crop, as the previous crop of cotton is manured and the residue of it is available for this crop. In the absence of such manuring to the previous crop, an application of five to six cartloads of farm-yard manure per acre will be useful.

Seed and Sowing.– It is sown in June by a three-coultered drill (*tiffan*) with rows twelve inches apart with a seed rate of 60 lbs. per acre. The distance between two plants in the same row is four to five inches. In some places, it is sown by a two-coultered drill, that is to say, in rows eighteen inches apart, with the result that the outturn is low. This groundnut does not spread and hence more than one foot distance between rows is not required. After sowing, the seed is covered by a plank harrow.

After-tillage and care.—The first interculturing is given a fortnight after sowing which is followed by a hand-weeding. The crop begins to flower in the third week after sowing. Two more intercultURINGS and hand weedings are given before the close of the second week of August in a normal season. The crop is to be protected from pigs and birds, crows especially. Use of arsenic baits, and of sulphur and potash powder is recommended to scare away these birds and pigs. A watchman manages an area of ten acres under groundnuts and is required from the end of August to the first week of October, or 1¼ months, and it costs Rs. 1-4-0 an acre to watch the crop.

Harvesting.—The crop is ready in three and half months. The vines are uprooted by hand and heaped. If required, harrowings are given to make easier the quick picking of the remaining nuts in soil. Some days after uprooting, the pods are plucked, and dried in the sun with occasional turning over, cleaned and stored. The experience of six years on the Jalgaon Government Farm has shown that the cost of cultivation including hiring of land at Rs. 18 per acre comes to Rs. 73-4-0 while the yield of 1,312 lbs. which is obtained valued at Rs. 116-1-5, leaves a net profit of Rs. 42-12-9 per acre under the treatment and conditions on Jalgaon Farm.

The profit is greater than with any other crop during the past six years.

Suggestions.—In the last year or two it has been observed that the produce received into the markets contains a certain percentage of a mixture of 'Small Japan' groundnuts (Red kernel) which are less valued on account of a lower oil percentage. Such a mixture of groundnuts commands a lower price and hence it should be stopped to keep up reputation of our groundnuts in the Bombay markets. The cultivators should reject such red kernels at sowing time, and this is possible and simple when the percentage of mixture is small. The same seed, if used year after year, tends to give a crop with smaller pods; newly imported seed on the Jalgaon Farm has given 100 lbs. extra yield with decidedly larger nuts, and therefore, the supply of seed should be renewed by getting the seed from the Superintendent, Government Farm, Jalgaon. Cultivators should send their indents to the Secretaries of their Taluka Development Associations, nearest District Agricultural Overseer, or Cotton Supervisor, or direct to the Farm Superintendent, Jalgaon. If these suggestions are put into effect, the groundnuts of Khandesh will keep the highest position among groundnuts in Bombay and other world markets.

PRINTED AT THE YERAVDA PRISON PRESS, POONA.

Gratis

Department of Agriculture, Bombay

LEAFLET No. 1 OF 1928

CONTROL OF THE ANTHRACNOSE OF GRAPE

Anthracnose, locally known as "*karapa*" (करपा), is a disease which *at times* causes considerable injury to the vine in some localities in the Bombay Presidency. Unlike powdery mildew, it does not yield to curative treatment and if no preventive steps are taken, the vines may be considerably damaged. However, normally the disease is of minor importance, but under certain environmental conditions it is capable of becoming so destructive as to constitute a grave menace.

The abnormally wet weather prevailing in the early part of November 1927 was responsible for the appearance of the disease in a virulent form in some localities, and as no preventive steps had been taken, the visitation proved almost disastrous to early-pruned vines, resulting in a severe injury to fruit-bearing wood. Through neglect of the preventive treatment some of the vinegrowers were "caught napping" and suffered heavy losses. In order to make available the necessary information regarding control, this leaflet is issued.

Symptoms.—Anthracnose affects all the green parts of the vine,—leaves, shoots, blossoms and berries. It is, however, more common on leaves and shoots in the Bombay Presidency, the berries being affected in serious outbreaks of the disease.

On leaves.—The fungus causes cankers (scars) on the petioles and veins of the leaves which become twisted and deformed. The young leaves are affected with spots.

On shoots.—Cankers or scars are also produced on shoots. These first appear as small brown spots which enlarge and become depressed in the centre. The spots are more or less elliptical. Should the canker form near the base of the shoot, it may either succumb or be so weakened as to be easily broken off.

On blossoms.—Affected blossoms fail to set their fruit. If the attack is early, the blossoms appear as if charred.

On berries.—The well-known bird's-eye spots are produced on the berries. The central portion of the spot is grey and somewhat depressed, and is surrounded by a circular red-purple zone.

If young berries are affected, they may outgrow the disease or may be killed. If severely attacked, they may crack exposing the seeds.

Conditions favourable to the development of the disease

Moisture and temperature play an important part in producing an epidemic of the disease. Moisture in the form of rain or dew-drops is necessary for the germination of spores and infection of the vine. Low temperatures seem to be very favourable to the development of the disease.

Vines planted in low-lying portions of a vineyard are more susceptible to anthracnose.

Early-pruned vines seem to suffer very badly from anthracnose in wet and cool seasons. That is to say, vines pruned before the rains have completely stopped are liable to be seriously damaged in wet seasons. In the Deccan, the best pruning time is the first week of October.

Control measures

As already pointed out, the disease becomes destructive during the wet and cool weather, and if the vines are properly protected during the monsoon as per items (2) and (3) given below, there will be little danger of fresh outbreaks in the following fruiting season. It must be borne in mind that there is no way of foreseeing what the weather conditions will be in future, and it is advisable to take preventive steps if only as an insurance.

In the Deccan, the following preventive measures may be recommended:—

(1) Remove and burn as promptly as possible the diseased wood.

(2) Spray with Bordeaux mixture (5-5-50) at the time when the new shoots are not more than eight to twelve inches long. This application should be given sometime in the month of May.

(3) The second application should be given in the latter part of July or early in August. In this application two pounds of resin-fish-oil soap may be added to fifty gallons


Fig. 1


Fig. 2


Fig. 3

Fig. 1. A bunch of grapes destroyed by anthracnose.
Fig 2. A bunch of grapes showing the well-known bird's-eye spots on berries.
Fig. 3. A portion of a shoot showing cankers or scars produced by anthracnose.

of Bordeaux mixture to increase the adhesiveness of the spray mixture.

(4) If the disease had been bad during the monsoon, the vines should not be pruned out early, *viz.*, before the first week of October, as they are liable to damage through late rains.

(5) Vineyards which suffered badly during the monsoon should be sparingly irrigated.

In order to understand properly the methods of control, it should be pointed out that in the Bombay Presidency the grape-vine is subject to only two important diseases, powdery mildew and anthracnose. One of these diseases, anthracnose, attacks the vine only during the monsoon and will not appear during the fruiting season if preventive steps are taken. However, if the vines have *not* been treated during the monsoon as outlined above, and anthracnose *not* kept under check, there is a danger of the disease developing into a serious epidemic when there are late rains. The treatment of the vines during the monsoon is therefore, more or less, an insurance against bad weather in the early part of the fruiting season, *viz.*, late October and the month of November. It should also be borne in mind that unlike powdery mildew, anthracnose is a slow-spreading disease and is not capable of doing appreciable damage if the vines have been properly treated during the rains as per items (2) and (3) above, effecting a considerable reduction in the sources of infection in the vineyard. It follows from this discussion that preventive steps taken during the monsoon are of much greater importance in the control of the disease than any curative treatment given after the disease has got a firm foothold.

BOMBAY : PRINTED AT THE GOVERNMENT CENTRAL PRESS.

Gratis /

Department of Agriculture, Bombay

LEAFLET No. 2 OF 1928

THE VALUE OF POUDRETTE AS A MANURE FOR COTTON IN SOUTH GUJARAT

The intensive cultivation of Cotton, which requires a dose of Bulky Manure for securing a heavy yield associated with the rise in price of Cotton during the past 15 years, has caused the price of Farm Yard Manure, the only manure available to cultivators, to rise in several places by 300 per cent. Hence, wherever possible, some substitute must be found to relieve the situation. For this purpose experiments on Surat Farm have been conducted since 1908 with Poudrette Manure.

Period of experiments

(1) From 1908-09 to 1913-14 and (2) from 1912-13 to 1920-21.

The average (leaving the bad years) yields of Cotton obtained, were as stated below :—

Period No.	Treatment in tons per acre	Average yield of seed cotton per acre, in lbs.
(i) *i.e.* (1908-09 to 1913-14 except 1911-12.)	(1) Poudrette 3	532
	(2) No manure	369
(ii) *i.e.* (1912-13 to 1920-21 except 1914-15 to 1916-17.)	(1) Poudrette 5	659
	(2) No manure	457

Thus when both the results are combined the average yield has been as stated below :—

Treatment	Crop	Average yield per acre of seed Cotton
		Lbs.
(1) Poudrette	Cotton	595
(2) No manure	,, ...	412

There has been a decided increase of 183 lbs. seed cotton per acre, *i.e.*, 44 per cent. over the yield of the no manure plot secured at an extra cost of Rs. 8 per acre (at the rate of Rs. 2 per ton of Poudrette). Besides Poudrette contains more Nitrogen namely 1·75 per cent. N. against 0·75 to 1·07 Nitrogen in the Farm Yard Manure, with which it was compared.

Method of using

Poudrette is available with the Municipality and it is applied to the Cotton Crop just as is Farm Yard Manure at the rate of 5 tons per acre.

The effect of Poudrette is not only visible on Cotton but the residual effect is also very marked from the increased yield of Jowar taken in rotation with cotton.

Wherever there exist municipalities, Sanitary Committees or Gram Panchayats, the preparation of Poudrette will be beneficial to both cultivators and local bodies as it is certain to increase the income of both.

Any advice required in this connection can be obtained on application to the nearest Agricultural Officer.

BOMBAY : PRINTED AT THE GOVERNMENT CENTRAL PRESS.

Gratis.

Department of Agriculture, Bombay.

LEAFLET No. 3 OF 1928.

USE OF POUDRETTE AS MANURE TO JOWAR (DHARWAR).

In the transition tract of the Karnatak the necessity of manure is always keenly felt for dry crops like Jowar and the fields are required to be manured every alternate year. The supply of farm yard manure is generally insufficient to meet the demand and hence it is essential to find substitutes. With this object in view trials were conducted on the Dharwar Farm with Poudrette applied to the Jowar Crop, for a period of fourteen years commencing in 1908-1909.

The average yields obtained during fourteen years were as follows :—

Treatment per acre in tons	Average yield per acre of Jowar grain (in lbs.)	Average yield per acre of Fodder (in lbs.)
(1) Poudrette, 5	1,087	3,580
(2) No manure	688	1,934

It will thus be seen that at an extra cost of Rs. 11-1-0 (with Poudrette costing Rs. 2-13-0 per ton), 58 per cent. more grain and 85 per cent. more fodder have been obtained. Besides the Poudrette used contained ·8 per cent. of Nitrogen as against ·5 to ·7 per cent. of Nitrogen in the local farm yard manure. The residual effect of this manure is also very marked on Cotton increasing the yield by nearly 11 per cent.

Method of using

Poudrette is obtainable from the Dharwar Municipality and it should be applied to the Jowar Crop in the same way as Farm Yard Manure at the rate of 5 tons per acre.

Wherever there exist Municipalities, sanitary committees or gram-panchayats the preparation of Poudrette will be beneficial to both cultivators and local bodies as it is certain to increase the income of both.

Any advice required in this connection can be obtained from the nearest agricultural officer in the district.

Q 8

BOMBAY : PRINTED AT THE GOVERNMENT CENTRAL PRESS.

Department of Agriculture, Bombay.

LEAFLET No. 5 OF 1928.

AN EXCELLENT RICE VARIETY (KOLAMBA No. 42): WHAT IT IS AND WHERE TO GET IT.

The Bombay Department of Agriculture has by scientific methods produced better yielding varieties of many crops such as cotton, tobacco and jowar. At its research Station at Karjat a very good variety of Kolamba rice which has been named No. 42, has been produced by selection. This variety has become popular. In 1922 there was about half an acre of it and now there are over 60,000 acres under this variety, in Thana and Kolaba Districts. Its main advantage is that it is a heavy yielder, giving about 20 per cent. more grain to the acre than the ordinary Kolamba. The grain is uniform, fine, has a lustre when seen in bulk and takes on a good polish. For these qualities it fetches a better price which has reached as much as Rs. 4 per khandi above the normal price for Kolamba rice. No. 42 Kolamba variety does not run heavily to leaf, it produces a good ear head, with little sterility in it and is specially suitable for low-lying positions of fields.

This variety has been found to be suitable for the Karjat, Pen and Panwel talukas of the Kolaba District, and Kalyan, Murbad, and parts of Shahapur and Bhivandi talukas of the Thana District. In the Mahim, Vada and parts of Shahapur and Bhivandi talukas of the Thana District in which the local *Kolamba* varieties are much finer than No. 42, the latter though high yielding, is not liked. In the remaining area, namely, Alibag, Roha, Mangaon and Mahad talukas of the Kolaba District, and Dahanu, Mahim, Bassein and Salsette talukas of the Thana District, which lying nearer the coast do not get as much rain as nearer Sahyadries, this strain No. 42 is not suitable. No. 42 has only a very limited scope under conditions where late Kolamba or other equally late varieties are grown at present. No. 42 is not suitable for salt rice lands.

The Department of Agriculture maintains a pure seed supply under the control of its own officers. Seed should

be obtained from a Government depôt or from a reliable grower who has recently bought the seed himself from a Government depôt. Depôts are generally maintained by the Agricultural Department at the taluka head-quarters and one or two more suitable centres in each taluka. The names of the reliable seed growers or of Government Depôts can be ascertained from the Agricultural Overseer of the district.

BOMBAY: PRINTED AT THE GOVERNMENT CENTRAL PRESS.

The Marble Bust of H. E. Sir Leslie Orme Wilson, P.C., G.C.I.E., C.M.G., D.S.O.,
Governor of Bombay.

THE POONA

AGRICULTURAL COLLEGE MAGAZINE.

VOL. XX.] DECEMBER 1928. [No. 3.

THE UNVEILING CEREMONY OF THE MARBLE BUST OF HIS EXCELLENCY THE RIGHT HON'BLE SIR LESLIE ORME WILSON, GOVERNOR OF BOMBAY, AT THE AGRICULTURAL COLLEGE POONA.

()::()

On the first of October 1928, in the evening was performed the pleasant ceremony of unveiling the marble bust of His Excellency the Governor which has been presented by the Chief of Aundh to be placed at this college, to perpetuate the memory of the Governor, as the originator of the first Presidency Agricultural show. It was unveiled by H. H. the Maharaja of Kolhapur. We give below the account of the proceedings which we hope will be of interest to the readers of our magazine.

The bust has been given a very prominent place in the Central Hall of our college which was all decorated that day. The dais was prepared towards the eastern side on which were arranged seats for His Excellency and Lady Wilson. His Highness the Maharaja of Kolhapur and the Chief and Ranisaheb of Aundh. To the left side of the dais were arranged seats for the College staff and to the right and in the centre were seated the distinguished guests and prominent people from Poona. The rest of the space was occupied by other members of the staff and their families on the College Estate and students. The whole hall and the gallery above was full.

His Excellency and Lady wilson, the Chief and Ranisaheb of Aundh His Highness the Maharaja of Kolhapur and other guests

were received by the Principal and other Professorial staff who could be at once distinguished from their academic gowns.

When all the guests were seated, the Chief of Aundh made a speech and requested H. H. The Maharaja of Kolhapur to unveil the statue. He explained therein as to how he was actuated to present this bust and why he chose the Agricultural College as the most suitable place for it. The Maharaja of Kolhapur before unveiling the bust dealt at length with the high personal qualities of His Excellency and his bright career as a ruler of this presidency. Dr. Burns, the Principal made a short and pithy speech and formally accepted the bust. Lastly after the bust was unveiled, His Excellency addressed a few words and thanked the Chief of Aundh, the Maharaja of Kolhapur and Dr. Burns.

We are certainly proud for the high tribute paid by His Excellency to the Principal and other members of the College staff for their excellent work that is being turned out, and wish our readers to refer to his speech which has been reproduced below, along with other speeches.

The proceedings then terminated with thanks-giving and garlanding the distinguished guests.

Speech by The Pant Pratinidhi, the Chief of Aundh.

Your Excellency, Lady Wilson, Your Highness the Chhatrapati Maharajasaheb of Kolhapur, Ladies and Gentlemen,

We have gathered here to-day to do something by way of perpetuating the memory of our most popular Governor His Excellency Sir Leslie Wilson. We all know that it was His Excellency who started the idea and who was closely associated with the Bombay Presidency Agricultural Exhibition which was held in October 1926 in Poona in these very grounds and which proved a grand success.

His Excellency has indeed made his mark in history by the well directed and solid work which he has done and by the keen interest which he has taken in the welfare of the Presidency and particularly of the Agricultural classes.

The exhibition and the particular arrangements of different Agricultural Industries suggested to me the idea of making an Agricultural survey of my State and to start industries on the same

lines. I have got the Agricultural Survey made in my State by the appointment of a special Committee and I propose to start some Agricultural industries for the benefit of the agricultural classes within my limited means.

While going round the several departments of the Exhibition which were so nicely organized and arranged and which were so instructive, an idea took root in my mind that I too should do something for him who has at his heart the will to ameliorate the condition of the agriculturists of the Presidency and who was the real originator of the Exhibition and who carried it out with such unique success. Gradually my idea assumed the form of a definite plan of presenting a marble bust of His Excellency and placing it in the Agricultural College which is, in my opinion. the fittest place in the whole Presidency and which, in my opinion will inspire in future the students of this College with a keen sense of duty.

I conveyed my wishes to His Excellency and His Excellency very kindly acceded to my wishes. I must heartily thank His Excellency for granting my request.

The work then began in right earnest. After discussing with Rao Bahadur P. C. Palil, the acting Principal of the College, I got Dr. Mann the Director of Agriculture to move in the matter. I am thankful to Dr. Mann for moving in the matter promptly and large share of the credit is certainly due to him. Then Dr. Burns, the Principal of the Agricultural College came to aid. Indeed a major portion of the success of to day's happy function goes to his share. He kindly agreed to place the bust in the College premises. He formulated the whole of to-day's programme, took the heavy responsibility upon himself and I am glad I am in a position now to request Dr. Burns to accept the Bust for the College.

Now comes the part that I have played in this affair. My State maintains the services of an old man of 70 belonging to an old Indian school for sculpture and of his young son of 20 who are present here in this hall. The old man's name is Pandurang Chimaji Pathervat and his son's Mahadeo Pathervat. I am really very proud of these two men. From mere photos they developed and worked out the bust even without the aid of a clay or plaster model. As His Excellency and the bust are before you, I leave it to you, gentlemen, to judge the standard of their skill. It is needless to tell that the work of the bust progressed from day to day under my personal supervision and it required an amount of labour and patience. These same sculptors have undertaken to work the statue of His Royal

Highness the Prince of Wales which I am going to present and which is to be placed at the Poona Station. I hope the happy occasion of unveiling it will follow in due course.

I must here thank His Excellency for the trouble and inconveniene that he was now and then put to in giving the required sittings for the final touches to my sculptors without which the work would not have been complete. I must make mention of the prompt services of Messrs. Ducket and Co. Poona for providing a beautiful pedestal for the Bust.

A difficulty again arose as to whom I should request to unveil the Bust. I am very glad to say that in the great and highly respected personage of His Highness Rajaram Maharaj Chhatrapati of Kolhapur, I found certainly the fittest person to perform the ceremony. I made the request and His Highness very willingly consented to unveil the bust. I must heartily thank His Highness for the kindness that he has shown in coming over here to his great inconvenience and trouble.

I must thank again His Excellency and Lady Wilson for the kindness they have shown in attending this function.

I also thank the Chiefs and Sardars of the Deccan, Dr. Burns, Rao Bahadur Patil and the Staff and all ladies and gentlemen for attending the ceremony.

I now conclude by requesting His Highness the Maharajasaheb to unveil the Bust of His Excellency the Right Hon'ble Sir Leslie Wilson.

Extract from the Speech of H. H. the Maharaja of Kolhapur.

Your Excellency, Shrimant Pratinidhi Saheb, Dr. Burns, Ladies and Gentlemen,

In one sense, I am indeed happy that my friend, the Pant Pratinidhi, has kindly invited me to unveil the marble bust of His Excellency Sir Leslie Wilson. The invitation gives me an opportunity to express in some measure my deep admiration for the personality of His Excellency which will now be commemorated in this great College for all times to come. I am very thanful to the Pratinidhi Saheb and to Dr. Burns, the Principal of the Collge, for giving me this opportunity to participate in the pleasant funtcion of this evening. I must also thank Rao Bahadur P. C. Patil who during the absence of Dr. Burns has been of assistance to me.

But, Ladies and Gentlemen, I am glad only in one sense. In another, I find myself in a somewhat awkward position. His Excellency and Her Excellency Lady Wilson have both very kindly accepted my invitation to be my guests at Kolhapur in about a week's time, when I am sure I shall have to tax the patience of Their Excellencies with a number of speeches. I must naturally. therefore, reserve a good deal of my thoughts for that visit of Their Excellencies to my Capital. A greater difficulty in the way of my speaking today about His Excellency is that my relations with His Excellency have been, for the last five years, too loving and too intimate to admit of being adequately expressed in any words that I could think of. Feelings, as you know, are beyond the realm of speech. Thinking for a moment of His Excellency as a subject matter for a speech by me, I have a very great complaint to make against him and his wife who have both made it impossible for me to look at them in a dispassionate manner. They fill me with feelings which I cannot myself understand.

Ladies and Gentlemen, my relations with His Excellency have had many sides, but the most valued of them can only be described as personal in the true sense of the word. One may hold different views on the different questions which His Excellency had to deal with and decide during his tenure of office. But only one view can be held with regard to the many personal qualities brought to bear upon the solution of the questions before him.

Ladies and Gentlemen, I do not wish to detain you longer in trying to tell you more than this about what I feel regarding the great personality of His Excellency Sir Leslie Wilson. He will be laying down his great office in a few weeks, but I feel sure that he has still long and bright career of public service before him. We all wished that His Excellency continued to be among us for a few years more, until the dissoussions of constitutional changes were over. I hope that the coming Elections in England will find him in the Parliament where his great qualities will be of service in wider fields. But I also hope that through working in other spheres His Excellency will not forget this Presidency and the many friends that he has made in parts of it.

The Bust which I am unveiling today will be one of the many memorials which His Excellency has been leaving behind him. This one will be, I am glad, among a class of young men who are expected to play an important part in the rural life of this Presidency. The students of this College must have their work laid out

more in the villages than in the cities and it is there that the example of His Excellency will be a sure inspiration for success to every one who derives the proper inspiration from this statue here. Students of the College, I wish you, as you see this bust everyday, will think of what has made His Excellency so popular among every section of the population in this Presidency. I am glad that my friend, the Pratinidhi, has presented the bust to your College. There is a great need for qualities such as distinguished His Excellency for not only those who occupy a high position but for everyone who wishes to do good work, whatever his position in life may be.

Ladies and Gentlemen, I am thankful to you for the honour you have done me by requesting me to unveil this statue. On your behalf, I will offer my sincerest thanks to the Pratinidhi Saheb for this valuable gift to the College. It is a gift which is entirely a gift from the Aundh State. As you have heard from the Chief-saheb, it is the hand-work of the artists of that State. I congratulate the Patharwats, father and son, who have done their duty so well. I must not however forget another artist whose name was not mentioned by the Pratinidhi but who is a master artist himself and must have had a large share in the making of the bust. That artist is, I am sure, no other than my friend the Pratinidhi himself. I congratulate him not only on his having such fine artists in his service but also on the great success of his "personal supervision" of the work.

Ladies and Gentlemen, I will now unveil the bust of His Excellency Sir Leslie Wilson, and hope that it will forever remind generations of students of this College of the great qualities which we have all learnt to associate with his Excellency and of the great work which he has done for the well-being of this Presidency.

Speech by Dr. W. Burns, Principal of the College of Agriculture.

Your Excellency and Lady Wilson, Your Highness, Shrimant Pratinidhi Saheb, Rani Saheb, Ladies and Gentlemen:—

We are fortunate in having with us to-day His Excellency the Governor and Lady Wilson. In these last few weeks of their stay among us their engagements are many and heavy, and I feel all the

more grateful to them for having found time to grace this occasion with their presence. We remember how Sir Leslie Wilson has visited this farm and College (it was a daily visit during the Show), how he has played cricket against us, and how we have received at his hands those prizes (including championships) which this College has always been able to win in the Intercollegiate sports. Of his inspiration, assistance and labour in all good causes, the Maharaja of Kolhapur has spoken at length. We are glad and proud to have in our hall this bust which will ever remind us of a strong and gracious personality.

When we consider the subject of the bust itself, the ruler who unveiled it and the ruler who gave it we know that it will be to us perpetually a memorial of the greatest significance. For it testifies to many things. It indicates to all posterity that real interest which the Governor and princes of this presidency take in the fundamental occupation of mankind, it shows their belief that agriculture can be improved by research, teaching and organisation, and finally it is a symbol of that goodwill which is the essence of all progress, and which is generated whenever sincere men combine to seek solutions for the elemental problems of the human race.

Agriculture is a subject often spoken of with despair by a certain class of people, but such people have not the imagination or the knowledge of those connected with this bust. What has been done for industry by intelligence harnessed to organised capital can be done for agriculture, but agriculture needs the same fertilisation by brains and money which industry has received. This College exists to train and apply the brain power, to which man owes all his conquests over nature. It works with a large vision and a large hope, and an occasion such as the present helps us on our way rejoicing. Any present who wish to look round the laboratories of the College after the present ceremony is over are cordially invited to do so, and will find there some exhibits of interest.

I wish to express our deep sense of indebtedness to His Highness the Maharaja of Kolhapur in so readily agreeing to dignify to-day's proceedings by unveiling the bust and addressing us. His interest in agriculture and his solicitude for the agricultural worker are well known and the Agricultural Institute recently opened in his state is another testimony to that interest. We feel highly honoured in his associating himself with this ceremony and we thank him again for his great help and encouragement.

To the donor, the Chief of Aundh I wish to express, what he already well knows, our great gratitude for this magnificent gift. Himself an artist, the Chief sought artistic expression for his feelings towards His Excellency, the College and the cause of agriculture, and we are the happy recipients of that gift. I know it has been prepared under his continuous and loving suppervision, and as representative of the staff and students of this College I have now the honour of formally accepting it.

Speech by His Excellency, the Governor.

Your Highness, Chief Saheb, Mr. Principal, Ladies and Gentlemen,

I find myself this afternoon in the unusual and some-what embarrassing predicament of taking part in a ceremony which is intended to commemorate not the work and the personality of another, but my own. I am accustomed to unveil the statues and pictures of others, and not so long ago I had the pleasure, here, of assisting in one of the most spectacular pageants staged in Poona for many years, the unveiling of the statue of Your Highness's illustrious ancestor, Shivaji the Great. The present function, however, is one of a very different character, and I am debarred from the practice which I usually follow on such occasions, which is to refer at length to the subject of the memorial, not because I know too little about the subject of the excellent bust which has been unveiled by Your Highness to-day, but possibly because I know too much.

Last Opportunity of Addressing an Audience.

This is one of the last opportunities which I shall have in India of addressing an audience containing so many gentlemen connected in one way or another, with agriculture. Some of you not only possess great landed properties, but also ruling powers over vast numbers of humble agriculturists, whose welfare is in your keeping. Some of you have adopted agricultural careers—or propose to do so—through the avenue opened up by this College of Agriculture while some of you are serving agriculture indirectly through the administration of Government Departments.

From the beginning of my term of office I have recognised that agriculture constitutes the basis of the life of this Presidency, and that there can be no real advance without a prosperous agriculture.

With this deep conviction, I have ever striven to do everything in my power to promote the advancement of this great industry. During my mofussil tours I have come to understand, in fuller measure how difficult is the lot of our agriculturists. The extent to which their position depends upon a capricious monsoon can only be realised through visiting the famine-liable zones of the East Deccan, and it has given me great satisfaction to witness the various activities not only of my Government, but also of many non-Officials, in the efforts which are being made to mitigate the hardships of the people and their livestock. Among all these efforts, I think, perhaps, the greatest credit should be given to the far-seeing Government Officials who conceived and carried out the fine irrigation schemes in the Deccan.

Counterpart of England's Royal Show

Soon after coming to this Presidency, I was struck by the observation that there had never been held a really big Agricultural Show, which could be called the counterpart of the Royal Show in England, which is annually patronised by his Majesty the King Emperor. It was for this reason that I called together, in September 1925, a very representative public meeting of the Chiefs, Sardars, and gentlemen of this Presidency, and put before them my suggestion that such a show should be organised; and I take this opportunity of once again acknowledging the spontaneous response which I received from all classes. Your Highness led the way with a splendid donation of Rs. 100,00, and your example guaranteed the success of the Show Fund. Apart from the handsome contributions of individuals, the District Local Committees took up the work of collecting subscriptions with great enthusiasm. As most of you are aware, the success of this Show was widely acknowledged, and by none more generously than by the Marquiss of Linlithgow and his colleagues of the Royal Commission on Indian Agriculture. I think it may fairly be claimed that not a few of the recommendations contained in their great Report owe their origin to things seen or discussed at this Show.

It is a matter of keen regret to me that I shall not be here when the time comes for taking action upon that Report, because I recognise that it is a State document of the highest value unique in its way, for never has the whole field of the rural problem in India been dealt with so comprehensively or so exhaustively. It would have given me the greatest personal satisfaction to have played a helpful role in supporting the Honourable Minister of Agriculture in giving

this Presidency the full benefits to be reaped from the practical application of such authoritative advice to the solution of the many problems which underlie rural reconstruction. I must content myself with making a very earnest plea on his behalf. I feel sure that the public men of this Presidency will prove worthy of the great opportunity which will fall to them in due course of backing a sound rural policy and that the Bombay Legislative Council will give the Honourable Minister not only its full moral support, but its practical assistance, by providing funds when the time comes for him to unfold his programme and to ask for the necessary finance to carry it out, for it must be recognised that effect cannot be given to many of the most valuable recommendations without incurring expenditure.

More Attention to be paid to Research

I consider much more attention than is given at present should be paid to agricultural research, because agricultural progress, to be real and permanent, must be founded on a wider and deeper knowledge of the subject. I would also commend the excellent recommendations pertaining to the problem of marketing agricultural produce. At present the tiller of the soil does not receive his full reward, partly because he does not understand the business of marketing, and partly because the markets are not properly organised and controlled. Any money spent in this direction would, I feel sure, be well invested.

Gentlemen, I have been greatly interested in the work of this College. It is the youngest of the great Colleges of Poona, but it differs from all other colleges in this Presidency as regards the personnel of its students. Most Colleges draw their students from one or more divisions, but this College attracts students not only from all the divisions of the Presidency including Sind, but also, through its reputation, from many other parts of India and beyond. Many students from Burma and Ceylon have received their education here while countries so far away as Iraq have been represented. It is essentially a cosmopolitan College, and this is a matter for satisfaction, as the students derive great mutual benefit from one another's society.

A Word About the Teachers

It must not be thought, however, that this College is merely a teaching machine— far from it. Unlike the practice in vogue at many educational institutions, the staff do not go off duty during the

vacations. On the contrary, every professor and lecturer, I am told, is expected to endeavour to make some contribution, however humble, to the sum of agricultural knowledge. In other words, most of the staff devote at least a part of their time to research in some branch of agriculture, and the record of past achievement is not negligible. Rao Bahadur Sahasrabuddhe, for example, has conducted an investigation into the fixation of free nitrogen from the air by the soil, which throws considerable light upon the retention of fertility by Indian soils, notwithstanding centuries of cropping with very little manure, and he has shown what are the conditions which promote the process. The economics of the village are receiving special attention at the hands of Professor Rao Bahadur Patil and the conclusions which he is deducing from these studies may, I hope provide a basis on which to found improvement schemes.

I am glad to have this opportunity of paying a tribute to the excellent work which is being done by Dr. Burns and his colleagues, and I wish the Poona College of Agriculture a long and honourable career, for I am confident that it will play an ever increasing part in the rural development of this Presidency and in the uplift of the agricultural masses. I am deeply grateful to Dr. Burns for his very kind remarks, and for accepting this Bust on behalf of the College. Need I say how really proud I am that a Bust of myself has been placed in this College, the centre of agriculture of the Presidency; and need I tell the Chief of Aundh how much I appreciate the thought which inspired to-day's ceremony? The Chief Saheb himself has told you how the idea originated with himself and all I can do now is to express to him publicly, as I have tried to do privately, my very sincere thanks. I congratulate the Patharvats, father and son, on their excellent work. That work was done under difficulties but how successfully you can see for yourselves.

If anything could have added to my pleasure to-day it is the happy thought which induced you, Chief Saheb, to invite His Highness the Maharajah of Kolhapur to unveil this Bust. I find it quite impossible to make any sort of adequate reply to His Highness's speech, particularly as I remember also that, in a few days' time, I am to have the great honour and pleasure of being his guest at Kolhapur, where, as His Highness has reminded you, I shall have to make some speeches, and I do not want to repeat then, what I could say to-day. I must content myself, much as I should like to say a great deal more with a very full agreement with His Highness as to

our personal relationship during all the time that Her Excellency and I have been in Bombay; and His Highness knows, as well as we do, that that real friendship which has existed between us and our families has been valued by us to a degree which is difficult to express in words. As this is so very true, you, Chief Saheb, will realise how deeply grateful I am to you for asking His Highness to perform this ceremony, and to His Highness for having done so in the most generous manner that he has.

I can only say again that it will be a matter of great pride to me to realise that this Bust stands in the Agricultural College, for all time to come; and I sincerely trust that the day is not far distant when these grounds will again see another great Exhibition, planned if possible, on even more ambitious lines than the last, and carried out with equal success.

CULTIVATION OF COTTON ON THE DECCAN CANALS.

BY

V. V. GADGIL, B. Ag.

Divisional Superintendent of Agriculture, Deccan Canals.

(With kind permission of the Indian Broad-Casting Company, Bombay.)

——)o(——

On the Deccan Canals Sugarcane was the only important money-making crop till 1924. During and after the Great War, the prices of Gul were very high and sugarcane-growers used to derive sufficient profit in cane cultivation and hence they did not pay much attention to the rotation crops—Bhusar crops were only intended to supply grain and fodder to the family and cattle. But the times soon changed and the prices of Gul began to fall rapidly and in 1924 it had gone to the lowest ebb viz. Rs. 17 per Palla of 250 Lbs. Since the opening of the new Pravara Canals, the area of cane has been increased from 20,000 to 31,220 acres on the Deccan Canals and there was a problem before the cane-growers how to dispose of their produce.

Necessity is the mother of invention and this proverb is also applicable in the cultivation of crops. When the cane growers were discouraged they began to look to other rotation crops-which were likely to bring more money. Cotton, Groundnut, Turmeric and Fruit trees were the main rotation crops to which they concentrated their attention. The Agricultural Department also gave them a helping hand in introducing these crops and the first trial of Cotton was conducted on ths Nira Canal during 1924. Two varieties of Cotton were tried; viz. (1) N. R. Cotton from Khandesh and (2) Upland Cotton from Dharwar. By experience of a year or so it was found out that the Upland (American) Cotton does not suit this tract as it is badly affected by Red leaf Blight and yields comparatively very low outturn. N. R. Cotton is the most suited to this tract and the yields are beyond expectation. In Khandesh it has been observed that if Cotton is sown in Rohini Nakshatra i. e. by the end of May, the crop is most vigorous and the same observation is applied to the Canal tract by introducing early sowing of Cotton by the middle of May. When the crop is sown early, the plants get sufficient time to develop their root system before the setting of Monsoon. In Khandesh Cotton is generally sown in the month of June after the first showers of rain and the average yield of dry crop does not exceed 600 lbs. of Kapas per acre. On the Canal tract people were advised to sow Cotton about the middle of May to make the best use of Canal water. The growth of the plant is forced by the heat of the Sun and ample supply of food and water and by the setting of Monsoon they are sufficiently developed to get the best advantage of rains. Flowering starts in July and the crop is ready for 1st picking by the end of August, 2nd and 3rd pickings are done in September and October and the crop can be removed by the beginning of November and the land is ready for the Rabi crops. As stated above the effect of early sowing is so marked that the cultivators have got yields upto 2,400 lbs. of Kapas per acre. The average yield of the Nira Canal may come from 1,000 to 1,200 lbs. of Kapas per acre.

Now let us see what other factors contribute to this exceptionally heavy yield of Cotton on the Canals.

(1) As stated above Cotton is taken in rotation with sugar-cane and all its residual effect of manure is available to Cotton. The plant-food is ready and the growth of Cotton is most vigorous in such fields.

(2) The high yield is also due to the selection of N. R. Cotton from Jalgaon Farm. The Farm seed is given to some intelligent cultivators and its produce is ginned under the supervision of the Departmental Officers. This is then supplied to the general cultivators. During the current year more than 50,000 lbs. of pure N. R. seed was distributed on the Deccan Canals with the help of Baramati Agricultural Association.

(3) Timely interculturing and weeding also contribute a good deal to the heavy yield. During the last season the cost of weeding was too high on account of continuous rain but it has paid to the growers who have done it timely.

(4) The best method of growing Cotton is to dibble the seed on the slopes of the ridges so that there will be uniform watering in hot weather and fair drainage of surplus water during the rains. The distance between 2 rows should be 18" and the distance between 2 plants in the same row 4 to 6." The tops of the plants should be nipped when the crop is one foot high so as to allow profuse branching.

(5) The last point about the cultivation is the clean picking which is awfully neglected in this tract. Picking is usually done by contract and the Kapas contains leaves and dust. As a matter of fact N. R. Cotton is fully opened and is very easy for clean picking. People should therefore devote special attention to this important factor.

The canal Cotton is superior in colour and ginning % and is generally sold as fine Umra. The staple is very short and the ginning percentage varies from 37 to 40. In Bombay this Cotton is sold under the Class of Nagar Barsi. But merchants prefer to mix the same with Nagar Barsi Cotton in order to improve their quality.

I will state below the area under Cotton of the Deccan Canals during the last 5 years.

1923-24	50	Acres.
1924-25	600	„
1925-26	2000	„
1926-27	6000	„
1927-28	14000	„

And the area is sure to increase when the Nira Right Bank Canal is developed. The new canal will command nearly 2 lacs of acres

and Cotton will play a very important part in this tract. In the Sholapur District highest yield of N. R. Cotton viz. 3000 Lbs, of Kapas per acre has been recorded under the well irrigation and people are anxiously waiting for the advent of the new canal.

When the Cotton was first introduced in 1924 there were no marketing facilities, but since last year 2 big Gins have been erected at Baramati and Cotton Markets have been organised in several centres. There are nearly 50 Power Crushing plants scattered throughout the length and breadth of the Deccan Canals and it is very easy for these cultivators to adjust one or two Gins to the oil engine and get their Kapas ginned. By this arrangement they will get the advantage of higher percentage of lint and they can supply pure seed to the whole tract. A small beginning has been made at Bavda and Baramati in this direction.

Now let us consider the economic side of this cultivation. If the crop is taken after sugarcane, the cost of cultivation does not exceed Rs. 80 per acre while the value of product varies from Rs. 150 to 250 per acre according to the market price of Kapas. During the last 4 years the lowest price of Kapas was Rs. 45 per Khandi of 500 lbs. while the maximum price was Rs. 95. The price of the last 2 years was steady at 75 to 80 Rs. per Khandi and people are sure to be benefitted even if the price goes to Rs. 50 per Khandi.

Besides it is interesting to note that the price of cotton is received at such a critical time when money is very badly needed, (November) for other crops and the cultivators are not required to be at the mercy of the Sawkars. The capital required for cotton is very small and they can easily extend the area under cotton.

One more point worth noting is the facility of irrigating cotton in hot weather given by the irrigation Department. The cultivators can now get sufficient water for soaking the land and two more waterings until the commencement of Monsoon for Rs. 5 only. The charges of Monsoon water are only Rs. 4. Thus a successful cotton crop can be taken with irrigation charges of Rs. 9 per acre.

A question would be asked as to what arrangement is being made about the manuring of Cotton in areas other than those of sugarcane and the Agricultural Department is now ready to put forth its recommendation in this connection. Whenever Farm Yard Manure is available they should apply 10 to 12 cart loads of this manure to cotton crop. Where Farm Yard Manure is scarce and costly they should apply 250 lbs. of Oil Cake at the time of sowing

and 100 lbs. of Sulphate of Ammonia or 125 lbs. of Nitrate of Soda per acre in one or two doses. This will give them good yields without spoiling the texture of the land. We have to thank the Trustees of Sir Sassoon David's Charitable Fund for offering a liberal grant of Rs. 1500 to introduce these manures on the Deccan Canals during the current year.

Introduction of Cotton on the Deccan Canals is really a boon to depressed cane growers and the crop is fairly assured even in the famine years. Both the cultivators and merchants look upon the development of this crop with high hopes. The Agricultural Department as well as the Agricultural Associations are giving wide publicity to this crop by distributing leaflets and we are thankful to the Broad Casting Company for giving us the opportunity to make it known throughout India.

MY EXPERIENCES OF A MODERN FARM TRACTOR, COST OF CULTIVATION, BELT WORK ETC., ETC.

BY

AMANTALI HABIBULLAH.

(*Dip. in Agri. Kusumkot, Dt. Amraoti.*)

I

Many attempts have been made in the past by different contributors, show organisers and Agricultural firms in India to give some figures and calculations as to the working, cost and other details for ploughing with Motor Tractors but many, if not all, of them have based their remarks on the results of short trials and demonstrations which last only a few hours or, at the most a few days, when every part of the machinery under trial is put in excellent order and the best and expert attention is given to it while being demonstrated. Thus anything judged from such trials of short duration

and any conclusion drawn, is bound to be erroneous and misleading. I therefore propose to place before landed aristocracy and the rural public some results of my experience with some modern agricultural machinery.

II.

There are various makes of Farm Tractors on the Indian market to-day, but those which are gaining popularity and are found suitable for the Indian conditions are :—

1. " Mc Cormick Deering " manufactured by the International Harvester Co., of America.

2. " The Cletrac " manufactured by the Cleveland Tractor Co. Ohio, America.

3. "The Case" manufactured by the J. I. Case threshing Machine Co., Racine, Wisconsin.

Out of these I have personal experience of the first named machine and the facts and figures given hereafter in this note are true for the McCormick Deering Tractors only, although broadly speaking, the results do not vary very much except in minor details for other tractors.

I have about 800 acres of land under direct cultivation. A " McCormick Deering " or commonly called an International Tractor (15-.0 H. P.) has been working on my farm for the last 4 years. It is being used for the following jobs :—

1. From the beginning of December till end of March every year, for running a small ginning factory consisting of 8 gins. (The actual working days are about 75).

2. From the first week of April till the break of the monsoon, for ploughing.

3. In certain years, from the end of rainy season, say from middle of September for a month or so, for Discing land prior to Rabi sowing.

I would take each item separately.

III. Ginning Factory.

(A). The factory consists of 8 gins (Platt Bros. single roller " McCarthy " cotton gin). Each gin if worked separately, and the power if applied direct, requires about 2½ H. P. But as intermediate gearing or second motion shaft is used (in order to work more than

one gin) some extra power is consumed, which in practice is found to be ½ H. P. per gin. Therefore 8 gins require 24 H. P. Mine is a 30 H. P. motor and therefore it pulls the load very easily. It is always safe and advisable to work an engine at a lighter load as it saves so much wear and tear.

(B). The factory is worked for ten hours daily (in two periods of five hours each with an interval of an hour). This gives time to factory labourers to take food and have some rest. In the mean time the driver looks to lubrication, cleaning etc.

(C). The running cost comes to about (i) Rs. 43-14-7 for the tractor and (ii) Rs. 33-7-2 for the factory (8 gins) as follows :—

TABLE No. 1.

(i) Working cost of tractor per day :

			Rs.	as.	ps.
1.	Driver at Rs. 60-per month	...	2	0	0
2.	Cleaner at Rs. 15-per month	...	0	8	0
3.	Kerosene 8 tins (4 gal. each)	...	24	0	0
4.	Petrol	...	0	3	0
5.	Mobiloil 1 gal.	...	3	0	0
6.	Gear Oil ¼ gal. app.	...	0	8	0
7.	Grease and cotton waste	...	0	2	0
8.	Interest (Table 3, b, 2,).	...	3	9	7
9.	Depreciation (Table 3, c, 2,).	...	6	10	8
10.	Repairs and renewals (Table 3, d, 2,)	...	3	5	4
	Total cost per day :	...	43	14	7

TABLE No. 2.

(ii) Working cost of Factory per day :—

			Rs.	as.	ps.
1.	Fitter at Rs. 90 per month	...	3	0	0
2.	Oilman at Rs. 20 per month	...	0	10	6
3.	9 feeder women (one per gin and 1 extra.)	...	2	13	0
4.	3 Kapas carriers at a. 8.	...	1	8	0
5.	2 men for filling and pressing bags	...	1	0	0
6.	2 women for removing cotton seed	...	0	10	0
7.	Mochi at Rs. 20 per month	...	0	10	6
8.	Ginning oil 2 gal.	...	2	0	0
9.	Breakage and repairs (spare parts, roller washers, beltings etc.) as shown in table 4, d, 2.	...	6	0	0

		Rs.	as.	ps.
10.	Interest on the outlay (table, 4, (b) 2.) ...	7	3	2
11.	Depreciation (table 4, c, 2.) ...	8	0	0
	Total cost per day : ...	33	7	2
	Combined cost of (i) and (ii) ...	77	5	9

TABLE No. 3.

(iii) Interest, Depreciation and spares for Tractor Outfit :—

		Rs.	as.	ps.
(a) 1.	Estimated to cost about ...	6000	0	0
2.	Maximum working period (on my estate) 5 months.			
3.	Average working period (ploughing on a farm or with a private owner)—3½ months.			
(b) 1.	Interest on Rs. 6000 at the rate of Rs. 9% p. a. (the whole amount of int. is chargeable on 5 months or 150 days) ...	540	0	0
2.	Interest per day at the above rate ...	3	9	7
3.	Interest per acre of land ploughed, (counting 5 acres a day) ...	0	11	6
(c)	Life of tractor is taken as 6 years,			
1.	The depreciation value comes to about 16.66% per annum (chargeable on 5 months or 150 days actually worked) ...	1000	0	0
2.	Depreciation per day ...	6	10	8
3.	Depreciation per acre (at 5 acres a day) ...	1	5	4
(d) 1.	Cost of repairs and spare parts as actually found (average of last 4 years) ...	500	0	0
2.	Ditto per day ...	3	5	4
3.	Ditto per acre ...	0	10	8

TABLE No. 4.

(iv) Interest, depreciation and spares for Factory establishment

		Rs.	as.	ps.
(a) 1.	Estimated to cost about Rs. 6000. (including building, construction work and erection etc.) ...	6000	0	0

			Rs.	as.	ps.
(b) 1.	Interest on Rs. 6000–at Rs. 9% p. a.	...	540	0	0
2.	As the working days are only 75, this amount of interest i. e. Rs. 540–is to be charged on 75 days and therefore it comes to per day	...	7	3	2
(c) 1.	Depreciation at 10 % (to be charged on 75 days only)	...	600	0	0
2.	Ditto per day	...	8	0	0
(d) 1.	Cost of repairs and spare parts for the season (75 days)	...	450	0	0
2.	Ditto per day	...	6	0	0

D. The outturn of clean cotton per gin comes to about are 5 Mds. or 410 lbs. per day (of 10 hours). Ginning charges are Rs. 2½ per Md. which gives an income of Rs. 12–8–0 per gin per day or Rs. 100 for the whole factory per day.

E. The net income therefore comes to Rs. 22–10–3 per day.

IV. Ploughing.

A. Ploughing is done in summer only which in this tract (Melghat Taluq of the Amraoti District) cannot be commenced earlier than April as the cotton crop occupies a longer period. The last cotton picking is done in March and so also the wheat is harvested in that month. The working cost of ploughing by tractor per day is shown in table 5 below :

TABLE No. 5.

			Rs.	as.	ps.
1.	Driver's pay at Rs. 60–per month	...	2	0	0
2.	Cleaner at Rs. 15–per month	...	0	8	0
3.	Kerosene (5 tins for 5 acres in 10 Hrs. or 2 gallons per hour)	...	15	0	0
4.	Petrol ¼ gal	...	0	6	0
5.	Mobiloil 1 gal.	...	3	0	0
6.	Gear Oil ½ gal.	...	1	0	0
7.	Grease and cotton waste	...	0	4	0
8.	1 pair of bullocks, a cart and a driver or waterman for fetching water from well	...	2	0	0
9.	Interest (table 3, b, 2)	...	3	9	7
10.	Depreciation (table 3, c, 2)	...	6	10	8
11.	Repairs and renewals (table 3, d, 2)	...	3	5	0
	Total cost of ploughing per day	...	**37**	**11**	**7**

B. From the above table (5) we find that the total cost for ploughing per day is Rs. 37-11-7 which comes to about Rs. 7-8-8 per acre (on the assumption of ploughing 5 acres a day). But, this is only true for a particular day or for a short period say a week or so. In actual practice we find that (i) continuous work for the whole week is never done as the driver must have at least a day in a week for rest, marketing and, looking thoroughly over his machine (that every thing is in perfect order) and for doing petty repairs etc.

(ii) Similarly continuous work for the whole month is not done as (a) sometimes the driver may be required to go to the town to get some repairs done there in a work-shop or at a blacksmith's and so on or (b) at times he might be compelled to wait for a spare part (having broken by accident or any other cause) which has been ordered out from Bombay. If unfortunately the place where the tractor is working is at a long distance from railway or post-office, as in my case, a considerable time is lost in transit, and therefore taking the whole month's average it is not possible to plough more than 100 acres a month.

C. Thus counting as above, 100 acres a month, the working cost of ploughing is increased per acre. The fuel and lubricating charges per acre remain constant while all other charges such as driver's pay, interest on the outlay, etc., are proportionately enhanced The ploughing charges therefore may go as high as Rs. 10 per acre.

V. Discing.

A. The working cost per day is nearly the same as for ploughing but the day's work is greater. On an average 8-10 acres are disced. The discing charges therefore come to nearly half that of ploughing.

B. The soil in my tract (Melghat Taluq of the Amraoti Dist.), being stiff black, very big clods come up after ploughing in the hot weather. The Disc harrow therefore is not a good implement for working as a cold crusher after ploughing in the cotton area. I use it only when the soil is moistened after a good shower of rain or at the end of rainy season for the preparation of the Rabi land.

VI. Conclusion.

1. International 15-30 H. P. tractor can be used for field work and belt (or stationary) work as well.

2. It can pull eight gins quite easily. The total cost per day (of 10 hours) for both tractor and factory (8 gins) comes to Rs. 77-5-9.

3. The outturn of clean cotton per gin when worked with the tractor is 5 Mds. or 410 Lbs. for 10 hours.

4. Taking a day's average it can plough about 5 acres of land (black cotton soil) in summer. Working cost per acre comes to Rs. 7-8-8.

5. In a tract of black cotton area a power disc harrow cannot be used for breaking clods after the land is ploughed.

6. The tractor can easily disc about 8-10 acres of land after a good shower of rain (the only idea being that there should be enough moisture in the soil). The working cost comes to about Rs. 4 per acre.

A GLIMPSE OF THE NIRA LEFT BANK CANAL FARMER AND HIS FARMING.

BY

S. T. PURANDHARE.

(Jr. B. Ag. Class).

The article, is in no way, meant to be a scientific one and the writer on his part, does not claim to be authoritative. The glimpse, as it is called, is simply taken from the point of view of a person who has visited and marked the conditions of the farmer in that tract The writer only claims to have made these observations during his stay there for a few months.

An examination of the conditions of the Nira-Farmer is in a way important as the Nira Left Bank Canal is one of the oldest and most famous canals of the Deccan, having the standing of 30 years. So also it has the largest area under its irrigation out of all other Deccan Canals. Thus the knowledge of this state of affairs will give an idea about the Canal farmers in the Deccan, and also it will denote lines on which new schemes of introducing Canal irrigation should be safely launched to the best benefit of the cultivator.

Now-a-days even Irrigation-Farming, in itself is an alluring and most charming idea on the first outset, as it was before 30 years, when the Nira Canal was opened in the year 1898 and irrigated the first acre in the Nira Valley. But the charm and novelty fades a little and some serious thought sets in when one thinks of the pit-falls and responsibility entailed in the enterprise. It is really a golden chance, but only to those who know the technique of farming and can turn it to best accounts with a practical business-man like attitude.

When the Canal began its work, eveyone of the landholders in the valley was overjoyed and thought that in the near future he would be a big wealthy man—a landlord—in the full sense of the term. But now how many of them are well-to-do is a question to be considered; and if a new chance of start is offered to them, none of them will proceed on the erroneous path that hitherto they had followed.

Let us first see if there are any faults in his method of farming. Broadly speaking his way of farm-management is fairly well—at least not positively bad. He has built up his land, follows, as far as is possible for an individual cultivator, improved methods of cultivation. He gives a good preparatory tillage with a good turnwrest-iron plow, his indigenous leveller and other implements, and lays out his land. He does appreciate the value of good seed and procures it either from his own stock or from his neighbour.

But on the other side it can be said that his seed rate is rather more than what has been advised by the Agricultural Department, with a blind idea of getting more yield. So also is the case with irrigation. He some how or other–the ways better be left undescribed-manages to get a small oozing from the canal outlet and then it is not unusual to see him letting in the flow of water in his field by evening time and leaving the water and the plot to adjust themselves during whole of the night. At times he is successful, but usually he fails and loses the whole or part of the crops, or at least spoils the physical texture of the soil if at all no harm is done to the crop. Generally it may be said that he is lavish in using water and does not fully grasp the condition of the soil and the crop, though he knows that excess of water means harm to the soil and the crop. The other point of negligence as regards weeding and marketing is simply due to lack of capital and not to any direct and visible fault of his. The management of finances, however, in such a way as to leave no money for such itmes is in no way creditable to him. Summarily it

may be said again that his way of conducting the farm is tolerable, though may not be good, and as regards the improvements he is willing to follow the recommendations of the Department.

Now comes the question of Co-operative Credit Societies, which are being amply talked of as the best means for the relief of the farmer from indebtedness. All through the village, it might be said, that the societies have been organized and also been accepted by the majority of the farmers as such. But now some of the societies, at least, have become "desirable evils." The cause of the vicious circle which began in the fact that they had been in a way donated to them as they did not know fully the responsibility entailed upon them. He looked at them with the same consideration as at a Savkar wherefrom he gets ample money for the time being, letting the consequences take care of themselves. He did not realize that he should be exact and business-like in dealing with the Society as he was a part and parcel of the society, sharing its losses and profits. Of course he needed money for his sugarcane crops and in the Society he found an easy supply. He drew carelessly upon it, with whatever means at his command, fair or foul, which need not be dealt with here, got the money somehow, spent it, some for his crop-need and some for his personal unproductive use such as marriage etc; and with the same mentality which is seen working while evading a Village Savkar, he tried to evade the Society also. And when it was necessary for him to take his produce to the Co-operative Sale Societies as the interest or instalment, of the loan, he stealthily sold it and got the money for his mainteance or for the Capital to proceed with his farming as no more loans were now available. But how far such state of things could go on ? And this is the problem of the present date. Of course the Society will have its money back from him. Some how, by the virtue of the power of all the preferential rights it enjoys over the Village Savkar, and the farmer is entirely at its mercy, even the Deccan Agriculture's Relif Act not coming to relieve him. Where will the farmer be when his house, farm, and equipment are taken away no one can tell—or rather even a child can say that.

The causes of this situation are mainly two. Firstly, he did not know what the institution of Co-operative Credit Societies meant to him and secondly his unbusiness like attitude of managing things. It may be said that the curse of our peasantry is not so much the lack of capital, though they are always short of it, but ignorance as to how to use whatever he has, like a practical business man.

He is never in the habit of keeping accounts and records, may he be literate or illiterate, and his finances are as it were held in the wind.

However it is not meant to say that the farmer at large on this side is all bankrupt and at the point of collapsing. Some have become wealthy no doubt, but the fact is there that since the time of canal irrigation rich men have grown richer and the middleclassed and poor farmers poorer. At the point of such a fall they are likely to be washed away from the tract for good.

Now it is beyond the power and knowledge of the writer to suggest any remedy, and he leaves it for abler and scientific men to remedy and to redress the miseries of the cultivator of the Nira Left Bank Canal.

CULTIVATION OF THE GROUNDNUT AND POTATO CROP IN NORTHERN PART OF KOREGAON, BEFORE AND AFTER SHIKAR-WORK.

BY

P. N. BHIDE Esq. M. Ag.

Officer In Charge Pig Campaign, Poona.

The chief commercial crops in Northern Koregaon are the groundnuts and Potatoes, while the chief grain crop is Rabi Jowar. Having been favoured by such congenial foods for which pigs have a special partiality and having got a comfortable nest in the thick Lantana on the slopes of the

hills where he could lie undisturbed, North Koregaon Tract was a veritable heaven for the pig, till the Agricultural Shikaris determined with the cordial help of the cultivators in this tract to oust him out. Two villages joined hands in the first instance to demonstrate by a trial hunt that pigs could be killed in the Palshi test jungle. Seeing the effects in decreased damage in these villages, in the following season more villages joined the first batch and carried on a Campaign to protect 450 acres of groundnut. Having successfully done this, the results achieved were so marked that twenty more villages followed suit and handed over the work of collection of voluntary contribution at a small scale of 6 pies per Rupee of assessment from the 24 villages to the Taluka Development association Koregaon and commenced work. The first big work of Campaign this group of 24 villages began in Dec. 1927 for the Rabi Jowar Crop, and at present six more villages have been added to this group with a possible addition in the near future of 20 villages in the eastern part of Wai Taluka. The Pig hunting group of villages formed for the one purpose of successful Crop protection and keeping the number of pigs in check will thus comprise of 50 villages next year.

The area under groundnuts and potatoes in this tract is rapidly increasing. Old methods of crop protection-building of watching lookouts in individual fields, the watching by night by individual farmers with the beat of kerosine drums andUkhali bar, have given way to the newer and more effective method of hunting the pig in the forest, by cordial co-operation in beating the jungle by day and sleeping comfortably at night. 8 shikaris are working in this part in two batches of 4 in a village group of 15 per batch. Most of these are local farmers trained by the Agricultural Department. This group of 50 villages have planted this year double the area under groundnut and potatoes as shown by figures under these crops in 1927 and 1928 in 16 villages. The voluntary fund collected by village committees stands at present at Rs 1500 approximately, and balance to be collected is Rs. 2340. On the example of this tract, Eastern Wai Tract comprising of 20 villages desires to join this group and help in completing the work of Pig destruction and Crop protection.

Increase in areas under groundnut and Potatoes in North Koregaon Tract as a visible result of Pig killing campaigns in 1926–27 and 1927-28

	Serial No.	Name of Village	1927 Before Campaign work. area in acres		1928 After Campaign work. area in acres	
			Gro nut	Potatoes	Ground nut	Potatoes
Groundnut Tract	1	Padali	350	...	500	...
	2	Kolawadi	66–10	...	125	...
	3	Palshi	110	...	250–7	5
	4	Gujarwadi	45	...	80–7	2
	5	Ambavde	175–1	3	225–5	15
	6	Banawadi and Dudhanwadi	50	...	95	...
	7	Asangaon	40	...	125	...
	8	Ghubadwadi	20	...	45	...
	9	Rautwadi	25	...	75	...
Groundnut and Potato tract	10	Wagholi	100	75	150	150
	11	Sarkalwadi	10	5	25	10
	12	Karajkhop	125	100	100	300
	13	Chavaneshwar	2	0	5	0
	14	Sulshi	60	7	125	18
	15	Randullabad	75	35	100	50
Total.			1[illegible]53–10	275	2025	550

PERENNIAL IRRIGATION IN SIND.

THE IMPENDING AGRICULTURAL REVOLUTION.

BY

K. S. DARYANI Esq.,

Inspector of Agriculture for publicity Sind.

—————():o:()—————

Sind is on the threshold of a great agricultural revolution. The great Barrage now under construction, across the Indus below Sukkur, is expected to provide perennial irrigation to some five million acres of land, of which about two million acres now receive an unsatisfactory supply from inundation canals and three million acres lie uncultivated for want of irrigation facilities, since rain fall in Sind is absolutely negligible. Thus there is every reason to hope that the new system will be highly beneficial to the Province; but it is necessary that the agriculturists in Sind must be in readiness for the coming changes outlined in the Project Report published in 1919 under the title "Report on the Indus Barrage and Sind Canals Project."

From the report it will be seen that on the Left Bank Canals the area under *Kharif* crops at present is 31 p. c. and under *Rabi* only 7 p. c., the remaining 62 p. c. being fallow; but under the new system it is designed that 27 p. c. of the area will be under *Kharif* and 54 p. c. under *Rabi* crops so that only 19 p. c. will remain fallow. This means that the agriculture under the Barrage conditions will become much more intensive and the old basis of agriculture in Sind, namely " Sind fallows " will practically disappear, so that manure or its equivalent will become a *sine qua non* of Sind Agriculture. Further the country side will be converted from an essentially *Kharif* tract into an essentially *Rabi* tract.

It is assumed in the Project Report that Cotton, Cereals, Wheat and Oilseeds will cover over 86 p. c. of the cultivated area; and when one remembers that irrigation has much more exhausting effect than rainfall upon the soil it is obvious that special precautions shall have to be taken to maintain the fertility of the soil, for the local supply of manure under the cropping mentioned above will be negligible. Even the artificial manures like Sulphate of Ammonia will not help much to make up this deficit, for continued irrigation has always an adverse effect on the physical texture of the soil, which can be rectified only by incorporating organic matter in some

form into the soil. The solution of this problem therefore may lie in growing green manure crops or in keeping more live-stock and thus developing a system of "mixed Farming."

Sound System of Agriculture.

It is therefore essential to chalk out a sound system of farming for Sind under perennial irrigation. In doing this, several other major considerations such as questions of alkaline salts, conformity to crop " duties, " provision of Fodder, earnings etc., must also be taken into account, in addition to the maintenance of soil fertility.

Kalar:—Alkaline (Kalar) lands are very common throughout Sind. In many cases ordinary methods of farming (except for rice cultivation) will not be able to control the *Kalar* salts. But experience shows that some crops are more resistant to the salts than others, and the cultivation of certain special crops enables *Kalar* land to be reclaimed. Such crops must form an integral part of a good cropping scheme.

Duty :—In the Project Report, it has been assumed that the agriculturists will be provided with a steady supply of water throughout the year, at the rate of one cusec per 370 acres of land ; and they will be expected to grow 100 acres of *Kharif* crops (rice excluded) and 200 acres of *Rabi* crops. A sound system of farming therefore must conform to these irrigation limits.

Fodder :—Under perennial irrgation it will be necessary to maintain the draft cattle in good condition as they will be required to do heavy and continuous work. Hence a sound system of agriculture must aim at reserving a suitable balance between money and fodder crops.

Earnings :—Subject to satisfying the conditions mentioned in the fore-going paragraphs the chief problem underlying the farming of a sound system of Agriculture will be raising the crops which pay best. Naturally cotton area in *Kharif* and wheat area in *Rabi* should be as large as possible.

Need for Research.

It is therefore essential to carry on investigations to frame suitable systems of agriculture and to solve other problems that are bound to arise, as a result of the gigantic agricultural revolution in Sind It is necessary to determine what crops and rotations will give the best returns both to the Government and cultivator, how salt land can be dealt with, what water will be needed by the crops grown and how best it can be applied, what varieties of each crop will

give the best results and how the land coming under perennial irrigation can be protected from deterioration and from diminution in the returns derived therefrom and so on.

When one considers, that about 20 crores of rupees are being invested in the Lloyd Barrage Project one can not over-emphasise the importance of research to tackle, in advance of the Barrage, the several problems that are bound to spring up. It is also essential to educate in advance the rural as well as the urban Public with regard to the Impending Revolution in the country's agriculture; or else there will be a chaos which will sadden the brighest hearts, or it should be remembered that perennial irrigation demands a much higher standard of intelligence and much greater out-flow of physical energy than do the haphazard inundation conditions. Hence importance of a vigorous campaign to educate the public with regard to the coming changes is as great as the need for Agricultural research.

IS THE INDIAN 'KAGDI LIMBOO' A LEMON OR LIME?

BY

V. H. KULKARNI. B. Ag.

Demonstrator in Horticulture, Ag. College, Poona.

—————):o()—————

There is perhaps no one in India who does not know what lemon or lime fruit is. These fruits are so very familiar with every body, due to their medicinal properties and the various domestic purposes to which they are put, that every village in every part of India possesses a few trees of these. Even such being the case, very few understand the difference between lemon and lime. The Common Citrus fruit-' Kagadi limboo '-which is so frequently used in daily life, is known to the general English-knowing people as lemon and rarely as lime. Some, taking both lemon and lime as one and the same fruit, say that ' kagadi limboo ' may be called as either lemon or lime. These two words are so very confusing with each other, that one is likely to be mistaken for the other; in fact,

the general tendency of the people appears to be that these two fruits are one and the same. This assumption of the writer is based not on mere reports but on actual experience.

Whatever the tendency of the people may be, it is a fact that the two fruits-lemon and lime-are two distinct types, and that the 'kagadi limboo' of India is not a proper lemon but a true lime. The common Id lemon or Jamburi is a variety of lemon. Of course, it is not the question of calling one fruit the other or changing merely its name but of actually observing and then determining whether 'kagadi limboo' of India, popularly known to the people as lemon, compares in any way either with the foreign lemon or lime.

The two foremost Citrus growing countries of the world—West Indies and Italy-grow two distinct varities. The former is well known for its lime industry while the latter ranks first among all the lemon industries of the world. It would, therefore, be necessary, to know the differentiating characters of the above two fruits and to see with which of these the 'Kagadi limboo' of India compares well.

The following table gives the main as well as the general distinguishing characters of the Italian lemon and the West Indian lime:—

Italian lemon	West Indian lime.
Main Characters.	
(1) A wingless petiole	(1) A distinctly winged petiole
(2) White flowers with pinkish tinge	(2) Purely white flowers.
(3) Flowers solitary, occasionally in pairs	(3 Flowers produced in axillary clusters.
(4) Apex of fruit prominently nippled	(4) Apex very slightly nippled
(5) A more or less shapely tree	(5) Tree with irregular struggling branches
(6) Comparatively thick skin-¼" thick	(6) Comparatively thin skin—$\frac{1}{16}$"thick.
(7) Yields comparatively less juice 37 to 39% by weight	(7) yields comparatively more juice-57to 59%
(8) Contains less Citric acid -6·5 to 7 % & more percentage of essential oil.	(8) Contains more citric acid—7·4 to 8 % and less percentage of essential oil.
(9) Comparatively richer in phosphoric acid	(9) Comparatively low in phosphoric acid

Italian lemon	West Indian lime.
General Characters.	
(10) Comparatively big fruit. 4 to 5 per lb.	(10) Comparatively small fruit 8 to 12 per.lb.
(11) Mostly an oblong fruit	(11) more or less a round fruit.
(12) Flourishes well under most conditions in subtropical regions	(12) Suits better to tropical conditions and to warmer subtropical regions
(13) Requires special conditions of soil & climate	(13) Comparatively easy to cultivate.
(14) Botanical name-Citrus medica, Var. limonum	(14) Botanical name-Citrus medica, var-acida.

The above description brings out the fact that lemon and lime can not be one and the same fruit, as there is such a vast difference between their individual characters.

Now, taking into consideration the characters of 'Kagadi limboo' it will be seen that it is an illshapely tree, has got winged petioles and has white flowers produced in axillary clusters. The fruit is also round and very slightly nippled. It has got very thin skin and yields juice above 50 p. c. It is also not exacting in its soil and climatic conditions. This description clearly proves that 'Kagadi limboo' has practically all characters of the West Indian lime and is in fact identical with it. The common Id lemon and jamburi compare well with the Italian lemon and as such they are the varieties of lemon and not of lime.

It will be thus clearly understood that the 'Kagadi limboo' of India is necessarily a lime and should always be called as such and not as lemon under which name it is known to the people.

THE PRESENT STATE OF LONG STAPLE COTTON IN INDIA.

BY

MR. P. S. KULKARNI

(Sr. B. Ag. Class).

———():o:()———

India has been regarded, as the original home of cotton. In India, cotton is known, from times immemorial. Manu, the authority on Hindu Law while composing his code, 'The Manusmriti' laid down a law, that, the sacred thread of Bramhin must be of the cotton fibre. Other countries seem to have known of it, only a few centuries back. Even to this day, the greatness, of the Dacca muslins is seen, ringing through the pages of Indian History. But with the advent of the British, the art of spinning and weaving received a set back, and was well nigh, choked to death, on the establishment of their supremacy in India. By and by, as the time passed, the quality of cotton, got deteriorated. Also, people, skilled in the art of weaving, gave it up, as the new age of machinery had its influence in relegating the art to the back ground.

Our real cotton trade, began in the 15th century, with England, in exchange of woolen goods, when the trade was done chiefly, by the Moor traders. In the 17th century, systematic import of cotton was begun, by England, as she gradually developed into a manufacturing country. In the 18th century, hundreds of bales were exported to England from Bombay and Surat.

In those days cultivators carried on cotton cultivation indiscriminately, without caring for the quality. Rather quantity was placed before quality. However India continued to be a regular supplier of raw cotton to England, which by the end of the 18th century, became the *cynosure* of all cotton for outside.

In the year 1787, efforts were done by Dr. Hove to improve the Indian cotton. In 1818 a cotton mill was started near Calcutta, and duty on cotton 10 s. per 100lbs was fixed. From 1829 to 1841 strenuous efforts were made by the East India Company to improve the staple In 1863 a commission was appointed to study, the cotton trade, which made certain recommendations, whereupon the Cotton Fraud Law

was passed. But while this law was in operation practically, few measures were taken to improve the quality till about the last decade of the 18th century.

For the manufacture of fine cotton goods better cottons are required. As India is one of the main stay of cotton for England importers have been suggesting to improve the length of staple. Lancashire is an important manufacturing centre and depends upon American and Indian long staple cottons. There is every likelihood of a shortage of American cotton for Lancashire in the near future, so, India will have to produce more long staple cotton to supply the needs. Even since 1902 Government of India has been working on the improvement of the staple of cotton.

By this improvement in the staple not only the rich manufacturers, of Lancashire but the Poor Indian cultivators also will be very much benefitted, owing to the high price which this long staple cotton will fetch.

India stands second in the production of cotton among all the cotton producing countries of the world. But 75 p. c. of the cotton grown in India is short staple, and only 25 p. c. long staple. Out of this 25 p. c., 15 p. c. is hardly suitable for the Lancashire Mills. As the Indian long staple and the Lancashire long staples differ, the follwing standards will give the correct idea of the commercially recognised long staple varieties of Indian cotton. Names of all long staple cottons are only given.

Lancashire Standard of Long Staple.$\frac{9}{10}$" of an inch and over.

No	Trade Name	Botanical Name	Tract where grown
1	Karungani Company I	Gossypium indicum	Tinnevelly area
2	Irrigated Combodia	Gossypium hirsutum	Madras
3	Punjab-American	Gossypium hirsutum	Sindh and Punjab
4	Dharwar American	Gossypium hirsutum	S. M. C.
5	Broach Navasari	Gossypium herbaceum	S. Gujrath
6	Sindh Egyptian	Gossypium peruviannum	Sindh
7	Bani	Gossypium indicum	C. P. and Berar.

Indian Standard of Long Staple ⅞th of an inch and over

No.	Trade Name	Botanical Name	Tract where grown
1	Dry Camodia	G. hirsutum	**Madras and S. M. C.**
2	Tinnevelly	Mixture of G. indicum & G. herbaceum	Madras
3	Westerns	G. herbaceum	S. M. C.
4	Saw-Ginned Dharwar	G. hirsntum	S. M. C.
5	Wāgad	G. herbaceum	N. Gujrath
6	Salem	G. herbaceum	Madras
7	Coconada	G. hervaceum and G. obtusifolium	Madras.

All over India in different chief centres, the attempts have been done to improve the staple of cotton. The Cotton Transport Act was passed in 1923, prohibiting certain areas from importing inferior varieties. So that mixing of varieties is stopped, and chances of deterioration of good varieties are lessened.

The success of American cotton has been comparatively a little. At present in the Punjab, Varieties like P. A. 4 F. and P. A. 285 F. are getting popular with the cultivator every year. 4 F and 285 F are approved for its staple by the Oldham Master Spinning Association. Such long staple varieties are very promising, and during the coming years they will be much in demand in Sindh on irrigated lands.

History of cotton in Sindh shows that exotic cotton was grown there in 1846. Experiments were made, to grow Egyptian and American cotton from 1904 to 1914. But few of the varieties could be acclamatized as perennial irrigation schemes were not numerous. When the big Sukkar Barrage is ready, 5 millions of acres can be put under long staple cotton.

In Bombay Presidency proper, there are four principle cotton growing areas. Commercially first area is of North Gujrat, Kathiawar and Cutch. Cotton grown here is *Dhollera.* All are short staple cottons, excepting wagad. Not much work of improvement is done here. Second area is of South Gujrat, comprising the

districts of Broach and Surat. Broach Cotton is well appreciated in the English markets. But due to the recent bad practices of mixing all varieties, the once reputed staple is now deteriorating. Department of Agriculture, has found out a cross, called 1027 A. L. F. Acrage under this variety is now increasing, as the Department is supplying seeds. Present acreage is 5 lakhs. Third area is of Belgaum-Dharwar Tract. Varieties grown there are Kumptha-Dharwar and Dharwar American. Great deal of selection work is done, and a strain called Gadag No 1 is found out. It also resists Leaf blight. Area under this strain is nearly 100,000 acres. This is an acclamatised American Cotton. Second selection is, Dharwar No. 1 from the Kumptha cotton. Acerage under this variety is 120000. Work is going on regarding crossing of Dharwar 1 and Rosea 15 for a long stapled high ginning variety.

Fourth area is of Khandesh where mostly neglectum cotton is grown. Cotton of this tract is all short stapled and high ginning percentage. Experiments at Jalgaon and Dhulia Farms are successful. They have found out new strains, one of which is called BXX 27.

History of work done in United Provinces, Central Provinces, and Berar tells that all work done. there is fruitless. United Provinces has not got a good climate for long staple, it being too dry, and short seasoned.

Central Provinces has spoilt the varieties by mixing. The fine long staple Jari and Bani exist in name only. In Nagpur and Chanda long staple Cambodia is newly introduced. Central Provinces practically do not grow long staple cotton.

In Madras, Agricultural Department is very keen in improving the indigenous cotton. Nearly all cotton grown in Madras is long staple, amounting to 3 lacs of bales. History of improvement here, dates from 1760. Systematic work was started in 1905. A Strain called Karungani company No. 1 was evolved in 1913. Then Sircar cotton, Nandyal 14, and Nagari 25 were selected. Irrigated cambodia covers a large area. In Madras they get the highest benefit due to the Cotton Pest Act and Cotton Transport Act.

In Hydrabad State much work is not done. Bani and Buri are grown and 5 lakhs of bales are produced annually. Hydrabad State has good chances for its cotton improvement. Now it would be appropriate to describe in the words of Mr. Johnson the possibilities of improving the staple, and general results obtained so far,

"There are further great possibilities in the direction, of growing cotton of ½" and over, in staple as the Agricultural Department has in recent years added about 400,000 bales of one inch staple, to the Indian crop, while the production of cotton, over ⅞ inch staple has increased approximately from 1161000 bales in 1914-15 to 2107000 in 1924-25. In other words, although the total crop during the period mentioned shows an increase of 44 percents, the increased production of cotton over ⅞ inch straple amounted to 81·5 percent".

This is the standing of the long staple cotton in India.

"COOPERATIVE COTTON MARKETING IN THE UNITED STATES OF AMERICA."

BY

K. H. ADVANI, Esq., M. Sc.

Lecturer in Agriculture, Agriculture College, Poona.

—():o:()—

Below is given a short description of one of the Cooperative Cotton Associations of U. S. A. which the writer had an opportunity to study on the spot.

Introduction.—The Association is known as "Texas Farm Bureau Cotton Association," which is an organization of Cotton-growers of Texas State (U. S. A.) who have joined hands to market their cotton in a business-like manner to secure for their cotton full value and the profits otherwise lost.

At the outset it is worthwhile to give the following facts :

Country.	Area in acres under Cotton crop (Annual)	Produce in number of bales (500 lbs.)
U. S. A.	40 Millions	16 Millions.
Texas.	18 „	5 „
India.	26 „	5 „

From the above figures, it is clear that the Cotton crop of Texas is an important factor in the Cotton market of the world and being

a chief money crop, the question of marketing the same is as much important.

The association is the outcome of some individual farmers' ideas who realized the necessity of marketing their cotton themselves and it was in the year 1921 that the scheme was started along the same plans as " Fruit-Growers Organization of California " amidst great opposition and criticism on the part of self-interested parties. Due to the untiring energy of the leaders and the hearty cooperation of the farmers, it has been able to hold its own and is progressing every year. In three years time one-seventh (about 50,000) of the cotton-growers of that tract had joined the association. One point of note in the cooperative marketing associations is that an association for perishable commodity will always have more membership that the one for non-perishable commodity.

Constitution :—The association is organized and incorporated under the laws of that State under the Cooperative marketing laws chartered there. It is affiliated to the "American Cotton-Growers Exchange" to which such associations of all cotton producing States of U. S. A. are affiliated.

The membership is limited only to the cotton growers including the Landlord or tenants, lessor or lessee of the land in that State, receiving cotton as rent-share. Fees for membership are $ 10,00 (one dollar is worth nearly three rupees) which covers all membership dues from entire life of contract and which amount is not actually paid but is deducted from the first year's sales at the final sattlement of the year.

Members have to sign an agreement by which the association agrees to take and the member agrees to give and deliver to the association all the cotton produced or acquired by or for him in that State for 5 years commencing from the date of joining; further he cannot sell any of his cotton to any one else till the period of contract and all the cotton is to be delivered at the earliest reasonable time after ginning. For failing to sell the cotton through the association a fine of 5 cents (i. e. about 2½ annas) per each pound is levied as liquidated damage. Why at all to have such a contract ?

(1) To insure the association with a certain amount of cotton which will give it a chance to contract with merchant.

(2) Expert staff of graders and salesmen cannot be hired cheap just for a short period only.

(3) Merchants and spinners will not like to do business with an organization that is not sure of supplying and that will remain in business only for a short time.

The association is a non-capital non-profit one. The proceeds after deducting the working expenses go to the members entirely. It is purely democratic, one-man one-vote regardless of the quantity of cotton supplied.

The whole State is divided into 20 districts and the members of each district voting one representative; these representatives form the Board of Directors to control and guide the work. Executive board is selected from the directorate while the members propose and define policies and select their officers.

Working:—Field inspectors are employed who travel all over the country to canvas, secure and deliver the cotton. The cotton immediately after ginning is delivered to the railway-stations to be sent to the associations' warehouses which are situated near the exporting points. There each bale is graded and pooled in grades by experts. One sample from each bale is taken out and divided into two parts, one is retained at the warehouse and the other is sent to the Head-Office. Each half carries a number which can be traced back to the individual bale.

The members get an advance payment of about 50-60 p. c. of the value of the cotton delivered to the warehouse and the remaining at regulated intervals.

All cotton is insured at cheap rates from the time it comes out of the gin to the time of delivery to any place in the world. No other business than marketing the cotton of its members is done The association in 1923-24 sold on an average for $ 100,00 a bale while the farmers sold for $ 75,00 a bale. The business has been on the increase as shown below which bears testimony to its popularity.

Year.	Bales handled.
1922	78,000
1923	182,000
1924	400,000

Selling is conducted by the Board of Directors who hire the best experts for the purpose. Sale-offices have been established in all of the principal cotton markets of the world where their agents are offering their cotton at all times. If in any year a satisfactory price is not offered, the cotton is held till better time.

Pooling:—The product of all the members is pooled together according to the grade, staple, colour and character which is a great step in the process of marketing. Each pool is for one full season and is divided into even-running lots of 50 bales or more. As the sales are being made from each pool, the member is paid according to the amount of his cotton in each pool. No member receives for all his

cotton the highest or lowest price of the year. Each one gets an average price of the season for that particular pool. This system of pooling ensures for each farmer the same price for the same quality and quantity regardless of the time of delivery or sale as the net proceeds are divided ratably according to the proportion.

Revolving Fund ;—2 p. c. of the sale price is reserved for this fund and whenever a member withdraws, it is left to the option of the Directors to pay him his share or otherwise. Whenever the members are in distress, help is given to them from this fund at the interest rate of 6½ p. c.

It has been experienced that such business associations get approval and support of generally all classes of men who have no selfish motive to go contrary. An important duty for an association of producers, organized to sell the products, is to do whatever else may be useful or needful to enable them to do business in the way they desire. This association undertakes to furnish its members with pedigreed and inspected cotton seed. Also it furnishes production-credit at a cheap rate of interest (7 p. c.) to the needful members on furnishing adequate security; but does not lend to the non-members.

Expenses :—With all their elaborate arrangements and the most efficient staff, the total operating charges are about 2·25 per bale.

Conclusions :—In short the great success which the association is achieving is in getting better prices for the farmers' crop owing to

(1) Elimination of waste, inefficiency and speculation at country markets.
(2) Elimination of country damage through a system of prompt warehousing.
(3) Collecting the samples and loose cotton, selling the same and paying the dividends to the members.
(4) Instead of dumping, merchandising is substituted i. e. orderly selling throughout the year according to the supply and demand rule.
(5) Direct dealing with exporters and spinners who are able to buy large even-running lots.
(6) Expert classing by its own experts who get full value of the grade and staple instead of working against as the brokers and street buyers are apt to do.
(7) Getting money at very low rates of interest for financing their scheme.
(8) Adoption of pooling system.
(9) Efficient business-like administration.

STUDY OF A FARM IN A COTTON TRACT IN SOUTH GUJARAT.

BY

B. S. PATEL, B. Ag. N. D. D. N. D. A.

Deputy Director of Agri. Gujarat.

AND

H. M. DESAI, B. Ag.

Lecturer in Agrirculture, Agricultural College, Poona.

——()·o·()——

Sajod Farm

(Years of study-from 1917–18 to 1925–26)

1. *Situation.* Sajod, the place of our study is in the Ankleshwar Taluka of the Broach District. It is situated on a road running from Ankleshwar to Hansot. It is within 3 or 4 miles from the bank of the river Narmada and about 6 miles from the Ankleshwar railway station.

2. *Soil.* The Soil is what is known as black cotton and contains a good deal of free salts. It is of heavier nature and cracks badly on drying and is badly drained. When the river is in floods the whole of the area of the farm is submerged under water and causes failure of crops.

Climate

3. *Rainfall.* The average rainfall is about 32 inches. July is the wettest month. Rainfall is in the monsoon season only.

Temperature. Hottest months are March and April. Frost is of rare occurrence. During the period of the nine years of which this study has been made there was frost only once i. e. in the year 1924–25. Temperature varies from 40°F in December to 112°F in May.

4. Average area of the farm per year was 58. 4 acres. Of this 9 9 acres per year were under grazing. The area under cultivation per year was 48. 5 acres out of which 25 5 acres were under cotton ; 12.2 under jowar; 5.8 under wheat and remaining 5 acres under other crops like Sesamum, Tur, Rice, Lang etc. (See statement No. 1.)

5. Out of the total 58.4 acres per year 21.2 acres were taken on lease. The average lease charges per year per acre comes to Rs. 9.9. On 37.2 acres of purchased land the interest charges @ 9 p. c. on the purchased value of land come to Rs. 13.7 per acre per year; besides the assessment on the same comes to Rs. 4.6 (see statement No. II) The purchase price of land comes to Rs. 145 per acre.

6. Out of 21.2 acres leased area per year 9.9 acres were under grazing and 11.3 acres under cultivation.

Out of 9.9 acres of the grazing area 5.4 acres were taken on nominal rent of Rs. 1-8-0 per year per acre with a condition to develop this into a good grazing area as the land was Inam land and it could be had cheaply. The lease charges for the remaining 45 acres of grazing land per year per acre comes to Rs. 10-12-8.

The lease charges for the cultivated area per year per acre comes to Rs. 13-7-0.

The difference in the lease charges between the grazing area and the cultivated area comes to Rs. 2-10-4 per acre per year (see the statement No. III).

Had it not been for the grazing area which could be had only on nominal rent, the average lease charges per year per acre of the leased area would have been more.

In this tract, a cultivator cultivating more than 25 acres of land has to keep some grazing area for his bullocks as the fodder from the cultivated area is not sufficient, because a large area is put under non-fodder crops. The grazing area is of less productive capacity than the cultivated area and forms a part of the holding of a big holder.

7. Statement No. IV shows the investment under different heads-

In the circulating capital all the current charges i. e. on seed, manure, labour, feeding charges of bullocks, miscellaneous expenditure have been included.

8. Statement No. V shows the analysis of expenditure on land which includes rent paid, interest @9% on the invested sum and the Government assessment. The expenditure on cultivated land per year per acre has come to Rs. 16-10-8.

The expenditure on bullocks including feeding, depreciation and interest on money invested and grazing has come to Rs. 10-7-6 per year per acre of the cultivated area.

Expenditure on implements per year per acre of the cultivated area comes to Rs. 1-5-7. This includes depreciation @ 10% and interest @9% on the sum invested.

Expenditure on labour comes to Rs. 12-3-0 per year per acre, charges on manure come to Rs 0-3-3 per year per acre, manure being not available in this tract.

Seed charges comes to Rs. 1-3-6 per year per acre. Interest on current capital at Rs. 9 % comes to Rs. 0-15-9 per year per acre.

Miscellaneous charges come to Rs. 4-3-4 per year per acre. These include purchase of hand tools, ropes, gunny bags, Stationary equipment for bullocks, oil for carts etc.

Total expenditure per year per acre of the cultivated area comes to Rs. 47-4-7.

9. Statement No. VI shows the outturn per acre and the value realised for the some of the important crops in different years. It will be seen that the outturns of important crops have varied as shown below;

Kapas	from	140	lbs	to	500 lbs.	per acre
Wheat	from	58	„	to	73.1 „	„
Jowar	from	160	„	„	872 „	„

The rates realised varied from Rs. 16 to Rs. 28-10-0 for 80 lbs of kapas, wheat Rs. 6 for 80 lbs.(and only once it went upto Rs. 8)jowar from Rs. 4 to Rs. 9-6-0 for 80 lbs. It is only in the years of scarcity that the rate of jowar ever went higher than Rs. 4.

From the statement it will be seen that the fluctuation in rates are greater in case of cotton.

10. The statement No. VII shows the value realised for different crops in different years.

11. Statement No. VIII shows the expenditure and receipts per acre per year. *The expenditure per acre per year comes to Rs. 47-4-7* and *receipts Rs. 61-2-7 if only cultivated area is taken into consideration.*

If the *whole holding* including the grazing area is taken into account the *expenditure and recipts come to Rs. 39-11-6* and *Rs. 51-1-6 per year per acre respectively.*

12. The statement No. 9 shows net returns for management. It comes to Rs. 13-12-0 per, year per acre on the cultivated area and Rs. 11-7-0 on the whole holding basis. If no interest is to be paid on the owned land the net returns will come to Rs. 20 per acre on the holding.

13. If we take the average outturn of different crops in different years it works out as under .—

Cotton	324	lbs.	Kapas	(average of 9 years)
Wheat	:91	„		(average of 4 years)
Jowar	659	„		(Average of 7 years)

14. Average rate realised for different crops for 80 lbs. comes to Rs. 20-14-0 for cotton, Rs. 5-11-0 for jowar and Rs. 6-8-0 for wheat.

15. The rates are for the years of higher prices, especially for Kapas. Now with the fall of prices this holding will pay much less while the cost will remain the same.

16. In the prices of cotton, jowar and wheat go below Rs. 15, 4, and Rs. 6 respectively for 80 lbs each and calculating that the miscellaneous crops will give about Rs. 30 per acre, the receipts and expenditure will make nearly both the ends meet without leaving anything for the management.

17. In conclusion we have to thank Mr. Y. R. Joshi, B. Ag. the manager of the above farm for allowing us to make the study of his farm, and giving us every assistance.

STATEMENT No. I

Statement showing the total area and the cropping scheme

Year	Total area acres	Area under different crops				Grazing area.
		Cotton	Jowar	Wheat	Other crops	
1917–18	23	9	...	7	...	7
1918–19	56.4	30	15	...	2	9.4
1919–20	62.8	9	26	11	8	8.8
1920–21	55.8	28	15	...	4	8.8
1921–22	55.8	22	11	7	7	8.8
1922–23	55.8	31	8	5	3	8.8
1923–24	74	30	8	12	12	12
1924–25	68	35	7	10	6	10
1925–26	74	36	20	...	2	16
Average per year.	58.4	25.5	12.2	5.8	5	9.9

STATEMENT NO. II

Statement showing the lease charges, interest and assessment paid on the land.

Year	Total area (acres)	Land on lease		Land owned		
		area (acres)	Amount paid Rs. As. Ps	area (acres)	Interest paid at 9 p. c.	Assessment paid.
1917–18	23	23	206 0–0	...	...	...
1918–19	56.4	30.4	359–0–0	26	342–1 –0	87–0–0
1919–20	62.8	20.8	198–0–0	42	592–0 –0	175–0–0
1920–21	55.8	13.8	91–0–0	42	592–0 –0	175–0–0
1921–22	55.8	13.8	108–0–0	42	592–0 –0	175–0–0
1922–23	55.8	13.8	115–0–0	42	592–0 –0	175–0–0
1923–24	74	25	176–0–0	49	642–12–0	202–0–0
1924–25	68	19	168–0–0	49	642–12–0	202–0–0
1925–26	74	32	464–0–0	42	586–9–11	175–0–0
Average for 9 years.	58.4	21.2	209–7·1	37.2	509–12–0	170–12–0
Average per acre.	...	...	9.9	...	13.7	4.6

STATEMENT No. III

Statement showing the classification of land on lease.

Year	Total area (acre)	Grazing area				Cultivated area	
		* Area on contract lease.		Area on lease.		Area (acres)	Amount paid.
		Area (acres)	Amount paid	Area (acres)	Amount paid		
1917–18	23	...	...	7	62–0–0	16	144–0–0
1918–19	30.4	7	10–8–0	24	30–0–0	21	318–8–0
1919–20	20.8	7	10–8–0	1.8	20–0–0	12	167–8–0
1920–21	13.8	7	10–8–0	1.8	20–0–0	5	60–8–0
1921–22	13.8	7	10–8–0	1.8	20–0–0	5	77–8–0
1922–23	13.8	7	10–8–0	1.8	20–0–0	5	84–8–0
1923–24	25	7	10–8–0	5	43–0–0	13	122–8–0
1924–25	19	7	10–8–0	3	32–0–0	9	125–8–0
1925–26	32	...	...	16	191–4–0	16	272–12–0
Average per year.	21.2	5.4	...	4.5	...	11.3	...
Average per year per acre.	...	...	1–8–0	...	10–12–8	...	13–7–0

* Seven acres of land wrs taken on nominal rent of Rs. 10–8–0 for seven years with a condition to develop it into a good grazing area. The land was Inam land. After seven years i. e. in the year 1925–26 the rent for the same land was raised to Rs. 100/– per year.

STATEMENT NO. IV.

Statement showing the investment under different heads.

Year	Capital on land.	Capital on bullocks	Capital on cattle shed and for storing Fodder.	Capital on implements.	Circulating capital:—seed, manure, labour, feeding charges and miscellaneous charges are included.	Remarks.
1917–18	...	...	...	...	146–1–6	
1918–19	3801–0–0	760–0–0	...	307–12–0	1060–6–0	
1919–20	2777–0–0	75–0–0	...	34–0–0	1408–7–5	
1920–21	...	...	...	66–0–0	1119–2–0	
1921–22	...	61–4–0	1278–0–0	...	975–2–1	
1922–23	...	151–0–0	...	33–0–0	1021–5–10	
1923–24	564–0–0	...	479–0–0	71–0–0	1112–11–3	
1924–25	...	60–0–0	35–0–0	78–0–0	1178–12–0	
1925–26	...	80–0–0	806–0–0	20–0–0	1562– 8–9	

STATEMENT No. V

Statement showing the expenditure :—

Year	Land (rent, interest & assessment). Rs. As. Ps.	Bullock chargs (Feeding depreciation interest and grazing) Rs. As. Ps.	Implement Deprecia-tion and interest Rs. As. Ps.	Labour Rs. As. Ps.	Manure Rs. As. Ps.	Seed Rs. As. Ps.	Interest on half the circulating capital at 9 p. c. Rs. As. Ps.	Miscel-laneous Rs. As. Ps.	Total Rs. As. Ps.
1917–18	144–0–0	62–0–0	...	114–1–6	...	32–0–0	6–9–0	...	358–10–6
1918–19	747–9–0	693–4–0	58–4–0	361–15–0	...	39–2–0	47–11–0	161–15–0	2109–12–0
1919–20	934–8–0	397–5–0	62–2–0	937–13–0	44–4–8	17–8–3	63–5–6	169–0–6	2661–14–11
1920–21	847–8–0	316–3–0	71–8–0	654–0–0	...	70–2–0	50–5–6	262–0–0	2251–10–6
1921–22	844–8–0	517–10–0	67–14–0	490–5–9	22–0–0	99–15–4	43–14–0	157–0–0	2243–3–1
1922–23	851–8–0	443–10–0	70–8–0	491–15–6	17–0–0	165–13–0	45–15–0	233–8–4	2317–13–10
1923–24	967–4–0	596–9–0	70–4–0	597–6–3	...	37–5–0	50–0–0	256–0–0	2574–12–3
1924–25	970–4–0	639–10–0	90–8–0	816–0–0	...	54–12–0	53–0–0	236–0–0	2870–2–0
1925–26	934–5–11	964–0–0	88–14–0	81[illegible]–14–9	3–0–0	18–0–0	70–4–6	363–0–0	3358–7–2
Average per year.	804–9–8	514–5–8	65–9–0	590–11–6	9–9–5	59–6–2	47–14–3	204–4–5	2305–2–8
Average per acre of the cultivated area.	16–10–8	10–7–6	1–5–7	12–3–0	0–3–3	1–3–6	0–15–9	4–3–4	47–4–7
Average per acre of the total area.	13–13–6	8–15–0	1–1–0	10–3–0	0–3–0	1–0–0	0–13–0	3–8–0	39–7–6

STATEMENT NO. VI.

Statement showing the yield per acre and the rate realised of main crops in different years.

Year	Crops	area (acres)	Total yield in pounds.	Yield per acre.	Value realised per maund of 80 lbs. Rs. As. Ps.
1917-18	Cotton	9	1640	182	26- 0-0
	Wheat	7	2000	285	6- 0-0
1918-19	Cotton	30	13920	464	22- 3-0
	Jowar	15	12800	853	9- 6-0
1919-20	Cotton	9	2270	252	16- 0-0
	Jowar	26	19200	738	4- 0-0
	Wheat	11	640	58	6-0 -0
1920-21	Cotton	28	11120	397	10-0 -0
	Jowar	15	8320	555	8-5 -0
1921-22	Cotton	22	5600	255	20-6 -0
	Wheat	7	5120	731	8-0 -0
	Jowar	11	9600	872	4-6 -0
1922-23	Cotton	31	7350	237	25-10-0
	Wheat	5	962	192	6- 0-0
	Jowar	8	1280	160	4- 0-0
1923-24	Cotton	30	4200	140	29-10-0
	Jowar	8	6400	800	4- 0-0
1924-25	Cotton	35	17200	500	21-10-0
1925-26	Cotton	36	11200	311	16- 8-0
	Jowar	20	10240	512	5-12-0

STATEMENT NO. VII.

Statement showing the value realised for different crops in different years.

Year	Cotton Rs.	Jowar Rs.	Wheat Rs.	Miscel-laneous Rs.	Total Rs.
1917-18	534-14-11	...	150-0-0	...	684-14-11
1918-19	3858- 4- 6	1509/-	...	...	5367-4 -6
1919-20	451- 3- 3	960/-	48-0-0	184-0-0	1643-3 -3
1920-21	1349- 2- 3	867/-	...	138-0-0	2354-2 -3
1921-22	1426-10- 0	525/-	512-0-0	139-2-0	2602-12-0
1922-23	2523- 9- 4	64/-	72-0-0	146-0-0	2805-9 -4
1923-24	1555- 0- 0	320/-	...	755-0-0	2630-0 -0
1924-25	4645-15- 4	...	...	1055-8-0	5701-7 -4
1925-26	2298- 8- 1	720/-	...	44-0-0	3064-8 -1

STATEMENT No. VIII.

Statement showing expenditures and receipts.

Year	Expenditure	Receipts	Remarks
1917–18	358–10–6	684–14–11	
1918–19	2109–12–0	5367-4-6	
1919–20	2661–14–11	1643-3–3	
1920–21	2251–10–6	2354-2–3	
1921–22	2243–3–1	2602–12–0	
1922–23	2317–13–10	2805–9–4	
1923–24	2574-12–3	2630–0–0	
1924–25	2870–2–0	5701–7–4	
1925–26	3358–7–2	3064–8–1	
Average per year	2305–2–8	2983–12–2	
Average per acre (on cultivated area)	47–4–7	61–2–7	
Average per acre (on holding)	39–7–6	51–1–6	

STATEMENT No. IX

Statement showing the Profit and Loss Account.

Year	Profit	Loss	Remarks
1917–18	326–4–5	..	...
1918–19	3257–8–6	...	Famine year, Good crops owing to low lying area, rates very high and hence more profit.
1919–20	..	1018–11–8	Floods
1920–21	103–7–9	...	...
1921–22	359–8–11	...	...
1922–23	487–11–6	...	...
1923–24	55–3–9	...	Famine; Cotton failure. Wheat failure.
1924–25	2731–7–11	...	Good and well distributed rain; good crops and good rates also.
1925–26	...	293-15–1	Monsoon rains poor; at the time of harvest rains and hail storm which spoiled the quality of the standing crop and therefore low rate.
Balance.	6008–10–0	...	
Average per year.	667–10–0	...	
Average per acre (cultivated).	13–12–0		
Average per acre (holding).	11–7–0		

OUR GEOLOGICAL TOUR

——():o:()——

FIRST PARTY

Tours are the most enjoyable and happy periods in the College life. The I. Ags have got the Geological Tour as an annual fixture and everybody of us was looking forward to the day of starting with the great expectation of having a very jolly time. Accordingly on the first of November this year, the First party left Poona at 2 p. m. by the M. S. M. Passanger under the leadership of Prof. Sahasrabuddhe and Mr. B. M. Joshi. We had the 3rd class compartments reserved for us, wherein we any how pushed ourselves with our luggage. I leave it to the reader, if he has not personal experience, to imagine how comfortable it is to travel in a crowded 3rd Class M. S. M. compartment, and 'how nicely we were crammed in' was the only expression that could be used to describe the situation.

Our first place of halt was Kirloskarwadi where we got down at 11 o'clock at night. We were very cordially received there and were very comfortably lodged in the Theatre-hall. Some of us took the fullest advantage of the iron cots lying idle there. That night was indeed a very short night, because when the golden rays of the Sun shook us out of our beds next morning we thought that we had slept for only an hour. In the morning, after taking tea, we were divided into two batches and taken round to see the factory, along with the founder, Mr. L. K. Kirloskar, the "Henry Ford" of India. We were very much impressed by the work done there. Then we had our meals and in the after-noon we went to see the smelting of iron.

From Kirloskarwadi, we came to Gokak where the Ghataprabha takes a mighty leap of 170 feet over a sandstone cliff in the picturesque gorge of Gokak. The sandstones, the mica, the schist were the specimens we collected on our way to the Gokak Falls showing thereby the origin of the soils of that tract. It is a beautiful sight to see the Falls on doubt, but to those who

have seen the world-famous Gersappa Falls, Gokak Falls appear to be a Nature's toy. Here we studied the arches, the troughs, the fissures etc.

After Gokak, we visited Khanapur and Londa on our way to Dharwar. At Dharwar, we went to see the Government Farm, where a number of experiments in Breeding, Manures, Rotation etc. are being carried on. We were shown round the farm and every thing was explained to us by the people concerned. We had also a fine bath at the Farm.

Gadag was the next place of visit on our programme. We had got previous information that plague was raging in the town, and Prof. Sahasrabuddhe had wired from Dharwar to the District Agricultural Overseer at Gadag to make arrangements for us in a bungalow, which was situated at a great distance from the plague affected area. We arrived there at night and the next morning we went out for observation and collection of samples. We collected milk quartz, mica schist, Haematatic Quartzite, diorite etc. In the evening we went out to see granite, felspar and quartz. After our day's work, we rested in a field in the evening. Surely then, we were reminded of the ancient Gurus and Shishyas sitting together in their Ashrams. There we had a very lively discussion over many topics of general interest, unconnected with our geological work. Believing in God, Prospects of getting Swaraj, Indian industries etc. were some of the topics under discussion. We spent the night at Gadag and started for Badami early next morning. At Badami, we saw the old caves and carvings. Some of them are, indeed very beautiful. We collected samples of sandstone here. Our halt at Badami was only about 4 hours and from there we went to Bagalkot. There we had one day's halt. We were accommodated in a Cotton Ginning Factory, which was a thousand times better then some Dharmashalas where we had to put up. Calcite, limestone, jasper, sandstone etc. were the samples we collected. A river was required to be crossed on the way to a hill where jaspers etc. are found. The size of the stones differs according to the distance from the river. Near the bank, we have fine textured soil; a little further, small stones and still further the stones get larger, and larger. While returning, some of the party crossed the river by swimming while the less adventurous bad to cross it in a boat (while going, all of us crossed in boats).

The last place of visit was Bijapur, the city of historical and ancient monuments. We saw many beautiful buildings built about

3 or 4 centuries back, which still testify to the fine workmanship of that time, like Ibrahim Roza, Jumma Masjid &c. and also saw Mulukh Maidan-the famous Gun. In the evening, we went out to see Gol Ghumaz, the most massive and wonderful building in Bijapur. Inside the building after seeing the museum of ancient vessels, silks, weapons, etc., we went to see the whispering gallery. The visitor simply is wonder-struck to see how skillfully such a huge dome must have been built when the egineering as a science was not greatly advanced. We spent about 3 hours there, singing songs, and making ourselves merry. How we then wished that our course ought to have been only tours and not dry, dull and monotonous class lectures!

From Bijapur, we came to Hotgi, where we got into a third class carriage on the G. I. P. broad gauge. What a contrast was this train to that of meter gauge M. S. M!

We reached Poona at about 4 p. m. on the 11th, after enjoying the tour.

In this connection, we feel it a duty to thank Prof. Sahasrabuddhe and Mr. Joshi who did their best to look to the comforts and conveniences of the party, and also Messrs Kottur and Kulkarni who explained to us every experiment carried on on the Dharwar farm.

V. R. BALKUR.
I. Ag. Class.

ACKNOWLEDGMENTS

We have great pleasure in acknowledging with thanks the receipt of New year's Diary from the Manager, Anath Vidyarthi Graha. As is reported by him, the diary has been printed on fully Swadeshi paper from the Deccan paper mills. It gives all the necessary information required by every body in his usual routine.

It is very nicely printed and the price of it is moderate. We commend it to the notice of our readers, not because it is a Swadeshi product, but because it comes from an institution whose avowed object is to serve as a charitable home and training institution for the poor youths. So the buyers of this diary will not only be purchasing a Swadeshi article but at the same time will be indirectly helping a deserving charitable institution.

* * * * *

We acknowledge with thanks the receipt of a copy of a book named '*Agriculture in greater India*' from Mr. G. B. Deshmukh, B. Ag. of the G. B. Gardens, Kirkee. It deals with information pertaining to Agriculture and Agricultural practices in parts of the country now beyond the borders of India, but formerly which were included within the Indian Empire. For want of space and time the review has to be postponed to the next issue.

COLLEGE NEWS AND NOTES.

:o:

The College reopened after a month's vacation on the first of November and soon after, the I. Ags and the Senior B. Ags went on their usual tours; while the Jr. B. Ags had their full time engagement in the hard task of Surveying, Levelling and Drawings. The Sr. B. Ag. tour this year had been exceptionally good and lengthy extending as far as the borders of British Baluchistan, and fulfilling its purpose to a remarkable degree of giving a finishing touch to our Collegiate education, with practically nothing remaining to complete our observation and study of Bombay Agriculture in all its details.

The final year students this year should deem themselves extremely fortunate in having been able to witness both the Presidency Agricultural shows during their College Course. The first

Presidency Agricultural show held in 1926 in the Poona Agricultural College grounds was unique of its kind. As it was the first of its kind held in Bombay Presidency, it was perhaps also the best in India. Although the get-up of the Ahmedabad show this year, was on no less grand a scale and with no less patronage by the public, still it required the huge massive buildings of our College, and the splendid vista of the foliage trees and gardens, to vie with the Poona show in its grandeur and excellence. The happy atmosphere of the whole show was unfortunately ruffled by the sudden and unexpected news of Lalaji's death at 7-30 A. M., followed by the panic of a fire at about 8·30 on the sad morning of seventeenth in the Pestology court, in which were exhibited a very valuable series of demonstrations and show cases dealing with the life history of Insects and Plant Diseases. His Excellency the Governor on visiting the scene expressed his sympathy with Professor Jhaveri-the Secretary of the section and with the other officers of the department, who had lost in a few moments the careful work of years.

* * * *

The unveiling ceremony of the bust of His Excellency Sir Leslie Wilson presented by the Chief of Aundh in commemoration of the first Poona Agricultural Show, took place on the first of October. The details of the same appear elsewhere in this issue.

* * * *

The members of the Education Committee of the Indian Statutory Commission visited our College on the 10th of October.

* * * *

We heartily welcome to our midst Dr. Burns, Principal of our College who after a short stay in England returned to India and resumed his duties on 22nd of September. Rao Bahadur Patil, acting in Dr. Burns' place, has reverted to his post as Professor of Agricultural Economics.

* * * *

Our hearty congratulations to Messrs Bhat, Menon and Sheshagiri, who have stood first in the last terminal examinations in Sr, B. Ag, Jr. B. Ag. and I. Ag, Classes respectively.

Our Agricultural Tour :—One of the pleasantest things in the world is going on a tour. We can enjoy society in a room or "behold the mighty minds of old" in a library but nature we can enjoy only out of doors. There is hardly anything that shows the capriciousness of the imaginations more than travelling does. For full twenty seven days from 29th October till 25th November, we, the final year students, were on tour through the Presidency, free from the curious medley of our class room lectures on diverse subjects. The fields were our study and nature was our book, forgetting the town in the country and despising the country in town.

The touring party consisted of 50 final year students, and 4 members of the staff-Professer Gokhale and Messrs Kulkarny, Desai and Patel; and it must be said to the great credit of Professor Gokhale to have devised such a constructive programme of the tour, for which act of wise judgment and taste he deserves our respect and love in no small measure.

A detailed account of the tour will appear in the next issue of our Magazine.

GYMKHANA NOTES.

No 5 Platoon, 1st Bombay Battation U. T. C. (I. T. F.) of our College goes away for camping under the Commad of 2nd Lieut. K. S. Kulkarni from 16th Dec. till the 30th. On joining the B. Company at the Engineering College at the 7.30. hrs, Company will proceed to Chinovad on route march—We wish them all luck in their sports and a Jolly good time in their camp.

The agricultural College Rovers have begun their weekly parades in all earnest. The get up of the Mandke Den is almost

complete in its Scouting equipments and the annual camp fire is arranged to take place in coming February.

* * * *

The attention of the readers is invited to the notification printed else where in this issue regarding the Social Gathering to be held on the 14th of December 1928. It is earnestly hoped that all the old boys of the Institution will avail themselves of this opportunity to pay a visit to their Alma mater and make the function a success.

Our Gymkhana:—Our performance this year in the Inter-Collegiate sports has been rather poor applying the standard of our excellence in sports in the previous years. All the same, a few of the Competitors have been able to come out successful. Three cheers to them! The following is the list of successful competitors:

	1st Prize.	2nd Prize.
One mile race :	Kolhatkar	
Fast walking	S. B. Pandya	Honsoti.
Weight lifting		Marwadi.
Cross-country race		N. R. Bhide.

The Foot Ball, Hockey and Tennis games are in full swing and we hope the teams will acquit themselves creditably in the ensuing competitions.

S. M. RAO.

The Poona Agricultural College Annual Social Gathering 1928.

GENTLEMEN,

We, the staff and students of the College of Agriculture, Poona, invite the presence of all the past students of this College on the occasion of the celebration of the 21st Annual Social Gathering and Sports to be held on the 14th December 1928.

The function aims at cementing the mutual tie of friendship and society between the professors and students, past and present.

We earnestly hope that all the past students will heartily respond to the call of the ALMA MATER by gracing the occasion with their presence and co-operating with us in making the function a grand success.

Any spontaneous out-come of help by way of contribution will be quite welcome at the hands of the General Secretary.

D. K. MAKHIJANI,
Hon. General Secretary.

Department of Agriculture, Bombay

LEAFLET No. 22 OF 1927

More Economic Water Lifts for the Konkan

There are two kinds of water lifts commonly found in Konkan; one is the counterpoise bucket-lift called "*okti*" in Marathi and "*dotte*" in Kanarese, and the other is the wooden Persian wheel or *rahat*. The former is the only one used in the southern part of the Konkan comprising South Ratnagiri and Kanara Districts, while in the northern part, the Persian wheel is the common water lift, the counterpoise lift being still met with here and there, and that too for small areas, *i.e.*, within 10 gunthas. The general features of these two lifts are described below.

Counterpoise bucket-lift (vide *illustrations Nos. 1, 2 and 3*).—This consists of a metal or wooden bucket attached to a bamboo pole fixed to a horizontal beam at one end, the beam being pivotted on a vertical support, the other end of the horizontal beam carries a counterpoise weight. On account of the cheapness, simplicity and the ease with which it can be erected, repaired and transferred from place to place and the rural conditions necessitating the use of human power, the "*dotte*" has been the most common lift in Kanara. But still, the *dotte* has its own limitations. For deeper wells, it is not efficient requiring too great skill and power. One man can work the lift for shallow depths but an assistant is required for deeper wells to work the lever up and down, by means of a rope. The capacity of the lift is only 500 to 600 gallons per hour and it is not, therefore, able to command more than 10 gunthas of irrigation.

On account of these limitations and for several other reasons, including the non-availability of human labour as in the past in the Kanara District, the people have now begun to think of labour-saving appliances. A water lift which can fulfil this object to an appreciable extent under the present economic conditions of the Kanara farmer can be found in the Persian wheel or *rahat*, so common in the northern parts of the Konkan.

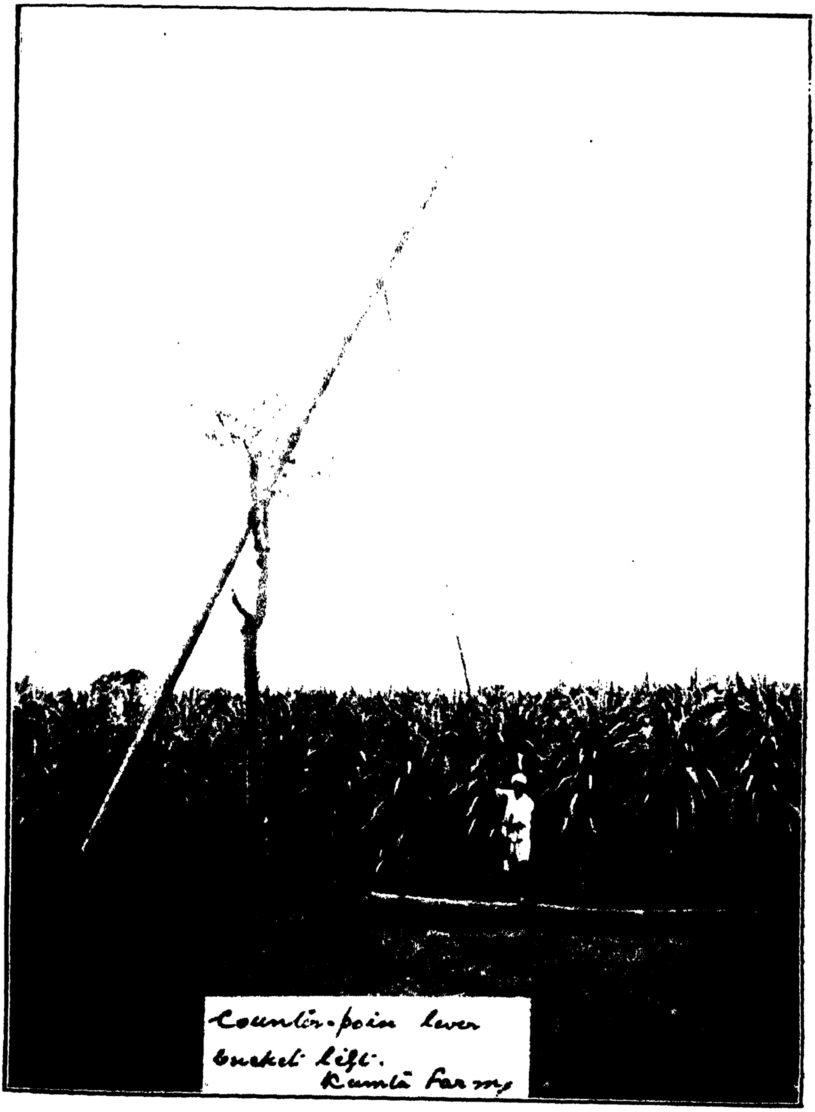
B 2467

*Persian Wheel or Rahat (*vide *illustrations Nos. 4 and 5).*—This consists of a large drum built on a central axle or shaft four to six inches thick and six to eight feet in length. On the surface of this axle, at both ends of this axle, are fixed 12 wooden spokes 2 to 2½ feet in length. These spokes are joined by horizontal bars 2 inches thick and nearly of the same length as the diameter of the drum. The ends of these spokes (12) pans of wooden verticals two to two and half feet in length, each pair carrying one horizontal row two inches thick and nearly of the same length as the diameter of the drum. The ends of these rows are joined by an iron wire or wooden to form a circle. The two ends of this shaft or axle rest and turn on two bearing surfaces, on single wooden posts or on masonry pillars at either end of the edge of a well or on beams across two posts on either end. The drum carries an endless and adjustable chain of rope reaching up to the water level in the well, across which pairs of wooden stays are fixed at intervals of 1½ feet more or less, to which earthern pots or buckets are to be tied to rest on these pairs of stays. When the drum is revolved round, these pots or buckets get filled in the well, are lifted up and empty themselves in the trough adjusted to rest within the drum.

The wheel is moved round by a man working with his hands and feet, as would be seen from the illustration, sitting on a plank placed across the well alongside the Persian wheel. This can also be worked by a bullock gear arrangements fitted on one end of the drum, in which case the beam is prolonged to sixteen to eighteen feet, on one side on which the bullocks can walk round by the side of the well (*vide* illustration No. 5).

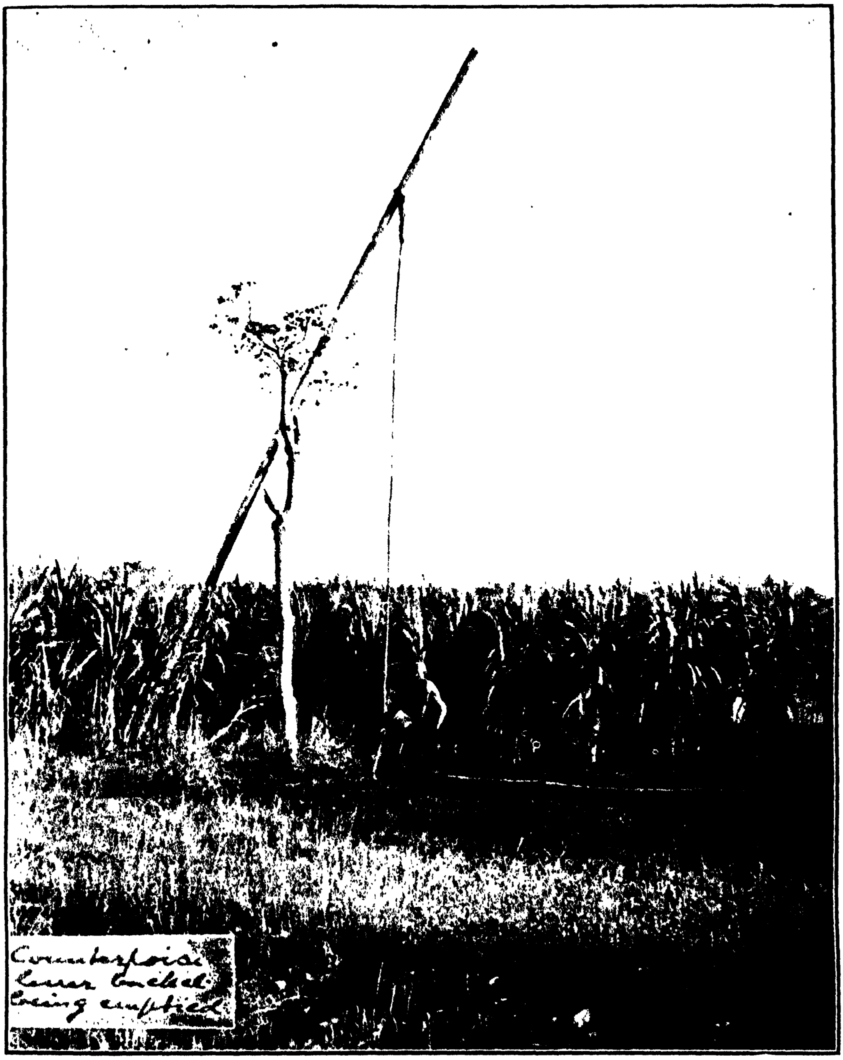
The Persian wheel can be prepared out of any wood such as teak, *matti*, mango, *undi*, etc. The one for human power solely would cost about Rs. 40 lasting for about 10 to 15 years. Cheaper sorts can be made out of any jungle wood, bamboo, palms of caryota or betelnut; but these can be expected to last for a couple of years or so only.

For the bullock power *rahat*, an additional expense of Rs. 30 would be required for cog-wheels and longer shaft beams. By those who can afford to spend the buckets made of galvanised iron plate are more economical and to be preferred to the earthern pots as the latter are liable to break frequently. The metal buckets would cost about eight to twelve annas each.

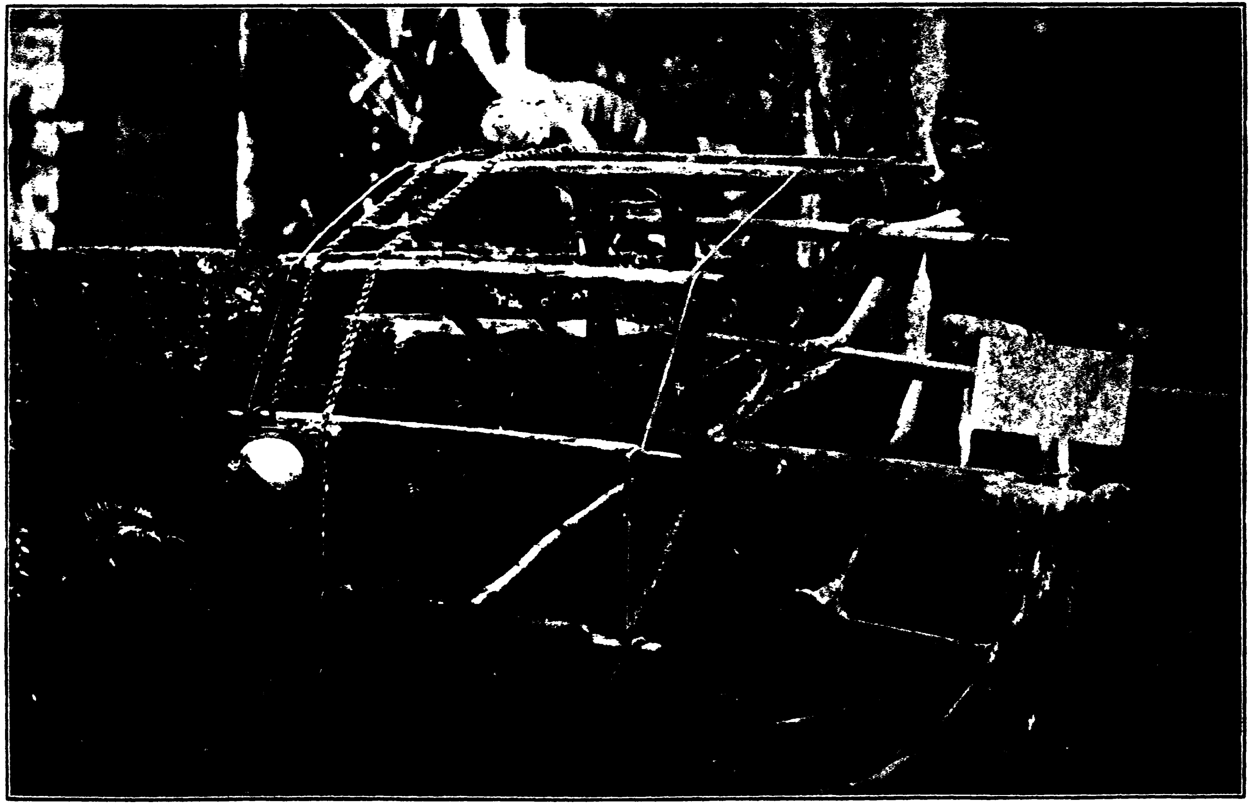


Counterpoise lever bucket lift. Kumta Farm.

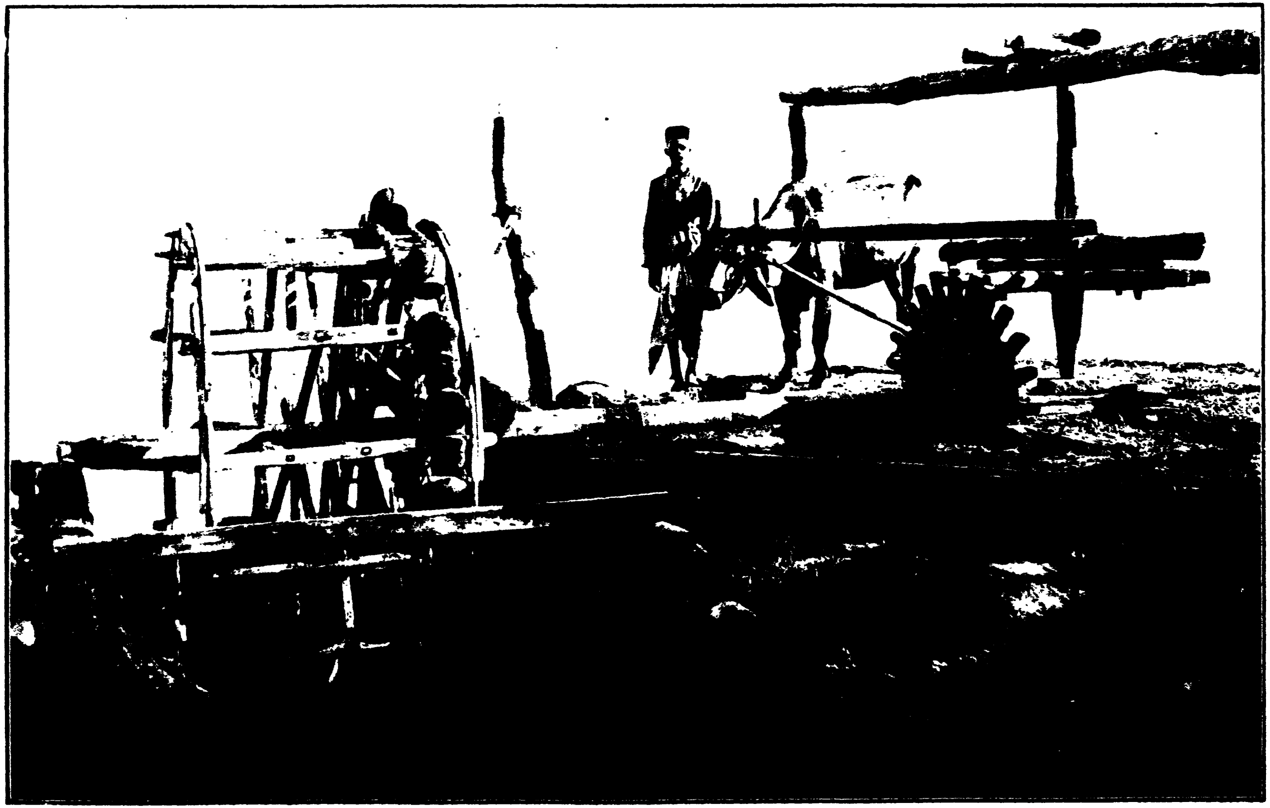
Counterpoise lift pressing the lever in the well. Kumta Farm.



Counterpoise lever bucket being emptied. Kumta Farm.



Local Wooden Persian Wheel of Ratnagiri District.



Bullock power Wooden Persian Wheel. Thana District.

The advantages of the Persian wheel over the counterpoise bucket-lift are—

(1) For an equal depth, the Persian wheel can lift at least $1\frac{1}{2}$ times the quantity of water done by the "*dotte*". For a depth of fifteen feet the Persian wheel draws 800 to 900 gallons of water as against 500 to 600 gallons by the *dotte* per hour.

(2) Persian wheel does not require much skill or strength to work, as in the case of *dotte* which can be worked continuously for a long time only by a good strong man, while women or children folk can work the former.

(3) Bullock labour which is practically idle in the fair season can be turned to use with a small extra cost of fitting a bullock gear arrangement once for all.

(4) The Persian wheel can be worked up to a depth of twenty-five to thirty feet, while *dotte* can hardly work efficiently below a depth of fifteen feet.

Of course the initial cost and the replacement of pots or buckets and the chain of rope and any contingent repair are somewhat more than those of *dotte*; but the advantages are also obvious. Any local carpenters can easily learn the work of preparing *rahats*.

The Persian wheel can be modified and made more efficient by adopting certain of Bulsar iron *rahat* devices as follows:—

(1) Iron cog-wheels for gearing may be fixed instead of wooden ones, to reduce the friction. The wooden cog-wheels are liable to break, requiring occasional repairs of the teeth. The simplest type may be made of thick iron bars $1\frac{1}{2}$ inches wide and $\frac{1}{2}$ to $\frac{1}{3}$ inches thick with iron pegs four inches to six inches rivetted tight and bent as to form the cog-wheels about three feet in diameter. The broader the wheels, the draft will be easier.

(2) The earthern pots or buckets may be replaced by those of galvanised iron plate, three-fourth to one gallon capacity each, the buckets having wider mouth, narrowing and sloping round the bottom.

(3) The wooden wheels of the drum can be similarly replaced by iron bars as in item No. 1.

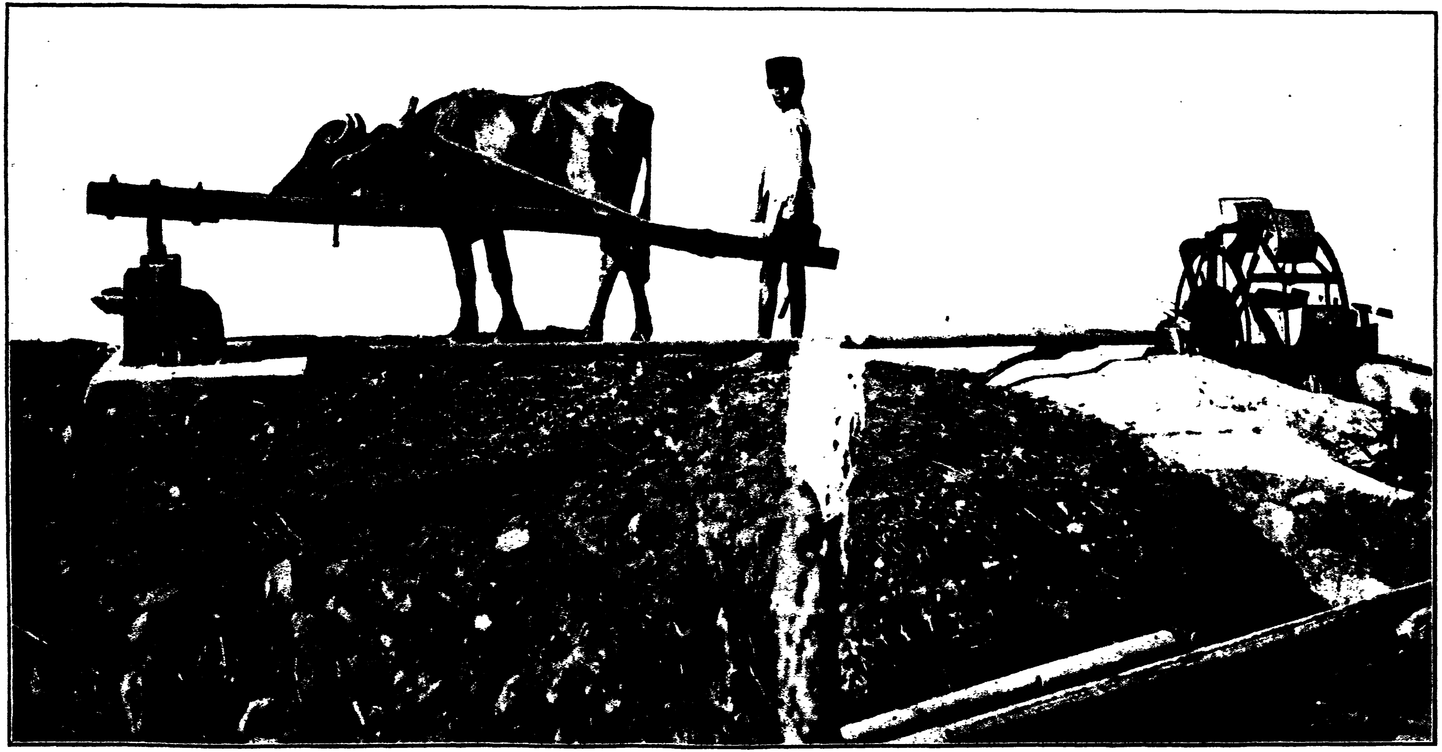
(4) The bearing surfaces on the wooden posts on which the axle beam rotates can be covered with a ring of metal plate to reduce friction while revolving the drum. This surface requires to be oiled every day before working.

More efficient and lasting types of *rahats*, wholly made of iron parts are called Bulsar *rahats*, manufactured by some mechanics (*vide* illustration No. 6). One of the makers is Maistry Chotabhai Dayabhai of Bulsar, Surat District.

Bulsar Rahat.—This is an improvement over the Persian wheel or *rahat*, inasmuch as the wooden parts are completely replaced by the iron ones and friction is considerably reduced, the mechanism being almost the same as in the wooden *rahats*. Hence the efficiency and durability of the Bulsar *rahat* are greater. The capacity of lift is much greater than for the wooden *rahat* for the same unit of labour and for equal depths. The shape of the metal bucket is peculiar and wide-mouthed, so that there is practically no wastage which in the case of earthern pots amounts to no less than 25 per cent.

These *rahats* are made in different sizes with different capacities of buckets, to suit human labour, one bullock, two bullocks and even four bullock powers, the sizes of the buckets varying from ¼ gallon to 3 gallons. The smallest size with ¼ gallon buckets is particularly useful for deep wells with narrow mouth and worked by hand, which conditions are altogether unsuitable for a Persian wheel or counterpoise lift. One and two bullock power Bulsar *rahat* with buckets of one to one and half gallon capacity can be said to be generally suitable to the economic conditions of the Konkan farmers. The biggest size of three gallons will require two pairs of good bullocks or buffaloes and can be useful for larger farms under conditions of copious supply of water. The capacity and prices of the various grades of the Bulsar *rahat* lift are given below :—

Size of Rahat.	Capacity of Buckets.	Area of irrigated holdings.	Price.	Remarks.
	Gallons.	Acre.	Rs.	
Hand Rahat ...	¼ to ½	½ to 1	150	Up-to-date prices may be ascertained.
One bullock power ...	1	1 to 3	250	Do.
Two " " ...	2	3 to 5	350	Do.
Four " " ...	3	5 to 10	450	Do.



Balsar Iron Rahat.

The advantages of the Bulsar *rahat* over the Persian wheel are as under:—

(1) Bulsar *rahat* can last for 20 years or more with occasional replacement of buckets and repairs to chain while the wooden *rahat* only for 10 to 12 years requiring frequent repairs.

(2) The efficiency of Bulsar *rahat* is about 50 per cent. more than the Persian wheel under equal conditions.

(3) One lift of a suitable size would be able to command larger area.

The addresses of the principal manufacturers of this lift are given below:—

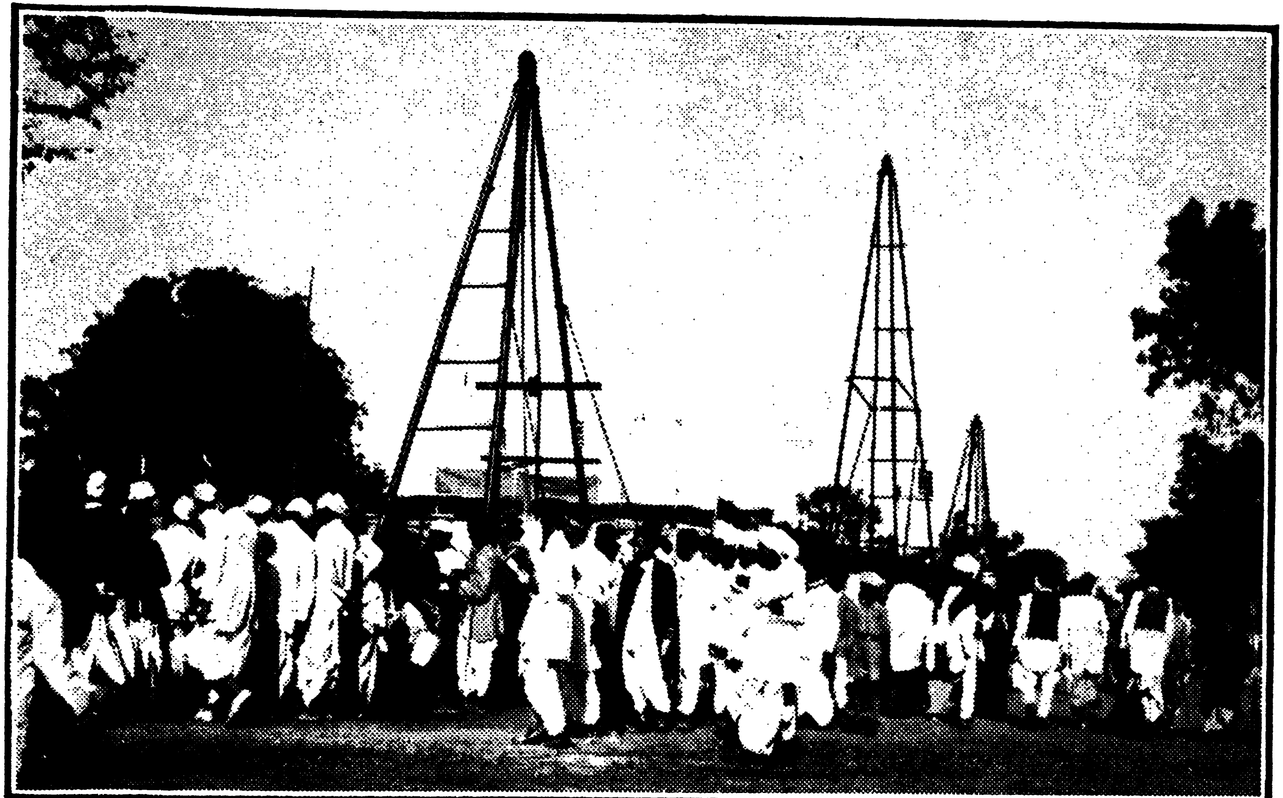
(1) Chhotabhai Dayabhai Maistry, Bulsar, Surat District.

(2) Chhotabhai Dayabhai Maistry, Rawiwar Peth, Poona City.

(3) Messrs. Shirgaonkar Brothers, Belgaum.

Any further information or assistance needed for obtaining these lifts can be had from the Agricultural Overseers of the District or the Deputy Director of Agriculture, Ratnagiri.

PRINTED AT THE YERAVDA PRISON PRESS, POONA.



Boring Demonstration at the Presidency Agricultural Show, Ahamadabad.

THE POONA

AGRICULTURAL COLLEGE MAGAZINE.

Vol. XX.] FEBRUARY 1929. [No. 4.

EDITORIAL NOTES.

:o:

This is the last number of our Magazine for this year which may be considered as an eventful one in many respects. Agriculturally this is an epoch-making year as it has seen the report of the Royal Commission on Agriculture—which is not only a repository of the most valuable information, but will serve as a 'Bible'—as Prof. Kale put it–for long time to come. The Government of India have been thinking of giving effect to the recommendations of the Commission and with the same view, a meeting of the Provincial Ministers for Agriculture and Directors of Agriculture was held at Simla in October last and in their deliberations they have settled upon the formation and composition of the Research Council. It will not be long before the new Agricultural Policy will be launched and we have to wait and see what changes are brought about so far as our presidency is concerned.

* * * *

The Christmas Season is one in which we see the annual floods of meetings, conferences and congresses and the atmosphere of the whole country is greatly ruffled, which is astir with different kinds of feelings and thoughts. The situation then calms down by the advent of the new year, and as every Researcher knows that a calm and quiet atmosphere is needed for researches, the Indian Science Congress holds its sittings after the floods are over. This year the Session of the Science Congress was held at Madras under the

presidency of Dr. C. V. Raman–Professor of Physics of the University of Calcutta. He is an eminent physicist and a scientist of worldwide repute on account of his researches in that sphere. Being a physicist, Dr. Raman in his presidential address mainly dealt with the most important and recent researches done in physics. The work of the physicist, as he put it, lies in trying to unravel the fundamental aspects of nature and to seek to understand those entities which lie behind the natural phenomena. His work has the closest possible bearing on the interpretation of facts observed in other fields of scientific knowledge. Then he explained in brief the researches carried on *light* and *radiation* and especially the series of experimental studies on the scattering of light in transparent media of all kinds. These were largely inspired by a desire to understand and explain fully such natural phenomena as the light of the sky, the dark blue colour of the deep sea and the delicate opalescence of ice in glaciers. The nature and significance of these experiments have a direct bearing on fundamental problems in chemistry.

* * * *

The agricultural section of the congress this year was presided over by Mrs. G. L. Howard who in her address dealt with the subject of "Improvement of Plants" In the course of her speech she gave a general history of plant–breeding in India, and said that though the modern plant-breeding had accomplished much, they were still a long way from the perfect variety in every crop. In India little or no fundamental work on the theory of heredity has been carried out. No University has yet a Chair or Reader-ship in Genetics which is an urgent necessity at the present stage, or else it will be increasingly difficult to maintain the economic work at the present level unless it is stabilised by a school of pure research in the country itself.

* * * *

The other sectional meetings, the discussions that followed and other popular lectures organised by the Science Congress were equally interesting and instructive. We may specially make a mention of Dr. Forster's lecture on "Chemistry as a Friend of Mankind" and Dr. Raman's humorous remarks on the same.

* * * *

The twelfth Indian Economic Conference had its sitting this year in Mysore under the Presidentship of the well known Economist–Prof. V. G. Kale of the Fergusson College, Poona. In the introductory remarks of his eloquent and comprehensive speech he remarked that perceptibly or imperceptibly economics is vying with politics in attempting to mould the destinies of humanity and no occasion is more appropriate than the present to take stock of our position. Then he dealt with various points like the paucity of ancient economists in India, the dawn of the new era, progressive economic investigation, economic practice in India and the like. Lastly, while discussing the point of piece-meal handling of economic problems he said that we have played hide and seek with our problems. Consider only the position of our Indian peasantry.

* * * *

The Revenue authorities study it from the point of taxation or rent. The Irrigation Department is concerned with its income from water rates. The Forest Department has its own rules to enforce on the peasantry in the best interest of nation's valuable property. The Agricultural Department wants the ryot to adopt its improvements; the Co-operators urge him to join their movement. Then there are others like the Finance member, Government and the Legislature, the advocates of Khaddar, and lastly even the Sawkar who are in their own way trying to better his position. But the problem is handled piece-meal. The friends of the ryot play at cross-purposes and nobody knows exactly how the agricultural industry and the peasant stand economically. It is hardly realised that no amount of research on crops, fertilizers and pure seed—though valuable in themselves,—will improve the condition of the peasantry until we study the ryot's life as a whole and in parts. An intensive study of the different aspects of his life and activities is indeed indispensable.

PRESIDENTIAL ADDRESS

THE ANNUAL SOCIAL GATHERING.

One of the chief criticisms brought against higher agricultural education in India, has been the point that very few men, in this country, who take a degree in agriculture, adopt agriculture as a profession. The records of this College show that there is considerable truth in this jibe, though there have been some notable exceptions to this rule. It seems to me that this must be a necessary or at least a natural phase in the awakening of India. Rural India has not yet advanced very far on the road to literacy, and it seems too much to expect the people, all of a sudden, so to speak, to thirst after higher agricultural education, or to appreciate its significance as a preparation for a business career in agriculture. The rural public must have time to take stock of the meaning of such education and to judge for themselves what it can add to a farmer's equipment in making him a more efficient agriculturist. This consciousness cannot happen in a day or a week. Experience indicates that at least a generation (in time) is necessary to convince the rural public of the value of higher technical education in agriculture, for agriculturists. During this period of observation the achievements of the graduates in agriculture within the Department itself and also in the Revenue Department are noted, and simultaneously the careers of a few graduates who have taken successfully to farming are watched. Gradually it dawns on the rural public mind that technical education in agriculture is a thing worth while for its own sake, and that it puts a powerful weapon in the hands of a young ambitious agriculturist. People come to realise that it is no good sowing any kind of seed or using any kind of plough or breeding from inferior bulls or growing *deshi* mangoes. On the contrary these operations are seen not to lead very far unless preliminary steps are taken to ascertain which is the best thing in every case, and to adopt it. Hence although the process is long-drawn-out, it seems to me that it can only be a matter of time until

higher agricultural education becomes the ambition of the progressive element in the rural population. Before many years pass by I hope the majority of the students passing through this College will give little thought to the idea of trying to secure Government employment. In the not very remote future, I trust this College will have achieved the double purpose, on the one hand, of supplying the men required to staff the Department of Agriculture and, on the other, of opening the eyes of the general public to the value of higher education as a prelude to a successful agricultural career.

It is commonly said, in more countries than India, that agriculture is a poor paying proposition, and it is true that the number of persons who make a fortune as distinct from earning a livelihood, out of agriculture, is comparatively small.

It has, however, been recognised in England, that while the ordinary farmer is unlikely to die a millionaire the way to make money, on a liberal scale, out of agriculture, is through specialization, and the same general proposition may be enunciated, with fair truth, as regards India; and that is the slogan which I should like to place before you, this afternoon, namely, "Specialization is the road to fortune in agriculture". By specialization I mean excellence in quality rather than narrowness in scope. To make myself clear, if you are a cotton grower in South Gujarat, I would advise you to concentrate on the "1027 A. L. F." cotton not as a mere producer of high class fibre, but as a grower of the purest and best seed. In other words you should aim at establishing a reputation as a seedsman to whom every ordinary cultivator, and even Government, would turn, when they want the very best obtainable seed of this variety of cotton. It is just as easy to grow a crop raised from superior seed as from inferior seed, but the former, when you have established a name for yourself, will command a high premium. Certain persons in Sind by merely selecting good ginning phuthis have established a seed business in which they sell cotton seed at twice the ordinary price. If you are a poultry farmer concentrate on the production of large eggs (2 oz. eggs), and have nothing to do with the small type of egg now produced in the Deccan villages. Take a leaf out of the book of a certain villager of Belgaum District referred to in a recent report of the Livestock Expert. Some time ago this man purchased a Leghorn cock and six hens. After the lapse of 19 months he was the owner of 450 Leghorn birds apart from sales which had realized Rs. 400 for birds and Rs. 80 for eggs. His cash expenditure is reported to have been Rs. 117-8-0. It is an interesting sign of the

times that even the Brahmin has taken to poultry farming as evidenced by the presence of several successful breeders in Poona and Satara Districts.

If you are a cattle-breeder leave no stone unturned to secure the best bull from tha Livestock Expert, and lay yourself out to breed bulls which will be as much sought after as the best Government bulls. If you succeed you will be able to secure fancy prices; for example one of our Kankrej bulls was sold for Rs 1500 some years ago. It is in this sphere that most money has been made out of farming in England in recent years. The best English bulls are so good that they have a world market and are bought at wonderful prices, for export to such countries, as South-America. Remember that Trinidad and Japan have, in the past, come to India for bulls.

If you are a fruit-farmer give Dr. Cheema no rest until he has supplied you with the best fruit-stock. Some of the exhibits in the Horticultural Section at the recent Presidency Show at Ahmedabad were very suggestive, indicating what immensely superior strains of Chickoo and sour lime, already exist, and merely require to be exploited by enterprizing growers.

Briefly my advice may be summed up, thus. Do not be content with ordinary farming, but insist on handling only pedigree stock, whether animals or plants, and thus secure premia or even fancy prices as distinct from ordinary market rates.

The same principle should be followed as regards the kind of produce you decide to go in for. For example if you grow vegetables select those for which the market is best. It is no good growing potatoes if the potato market in your locality is glutted. Pick something else for which there is a keen unsatisfied demand. I recently saw a good example of success in this direction. The Bassein Garden cultivators have devoted great attention to betel vines, and have captured a good market for their leaves, as far afield as the North West Frontier of India.

A third way of applying the same principle of specialization is by watching the seasonal supply and demand for produce. We have a very good example at our doors in Poona. It is well known that *gul* made in the autumn months commands a higher price than that made in April, simply because the bulk of the crop comes on the market at the latter time. Another good example is seen in the groundnut crop. The world's supply is deficient in August, hence the early variety of groundnuts grown in Khandesh, which is the

first to come on the market in India, commands a higher price than it would do if sold in November.

Generally it may be said that the farmer who succeeds best is he who differs most from his brother, as regards choice and quality of his produce-and if, as I sincerely hope, many of you intend to take up private farming, I would advise you to set this ideal before your eyes.

I would commend one further point to the attention of the ambitious Indian farmer, and that is, he should try to market his produce, not in the rawest possible form, but after working it up to a more advanced form where possible. It is most unsatisfactory for the grower of a good-ginning cotton to sell his produce in the form of kapas. It is quite easy for a Co-operative Society or even for a substantial individual to set up a couple of gins and an oil engine in his village. In this way the farmer, not only, retains his own pure seed but he markets his cotton in the form of lint, for which there is a wider market than for seed-cotton, and in addition, keeps the profits of the middlemen in his own hands. Similarly the progressive farmer should shell his own groundnuts and retain the husks for return to the soil. It would be easy to quote further examples but I need not labour the point, because it must be abundantly clear to you that success in agriculture demands enterprise and I have endeavoured in the course of these remarks to indicate the great scope for the application of brains and resource to agriculture.

Try and get into your heads that farming is not only the most interesting profession in the world, but is also a good business proposition in the hands of the progressive, intelligent and pushing type of man. For examples of success, you have several close at hand, but perhaps the most impressive of these, is to be found among the boys who have passed through our Agricultural Schools. Remember that these boys have not had one quarter of the advantages of an Agricultural graduate, yet among them I can point to cases which are worthy of your admiration and imitation.

I will briefly tell you about the performances of a few of these boys.

* I. Sankappa Adiveppa Pujar of Devi-Hosur, Taluka Haveri in Dharwar District—

---

* This part of the address was left undelivered for want of time.

This boy had only a few acres of land when he passed out of our school and his father soon after died leaving a debt of Rs. six or seven hundred in the local co-operative society. This boy made a modest beginning by taking some additional land on long leases on low rates of rent and keeping two bullocks and working the land himself without the aid of a servant. He took up land improvement on his own lands and got all the lands that he tilled free of weeds and took to growing such remunerative crops, as Upland cotton, groundnuts, chillies and so on. The important point to note in connection with this boy is that the income he got from the land was utilised, by exercise of economy in household expenditure, to pay off the old debt and the surplus invested in further improvement of the land. As this surplus began to gradually accumulate by proper work and exercise of economy, this surplus was loaned to others and their lands taken on nominal rate of lease representing the rate of interest on the money loaned. Thus the boy could accumulate in a few years more than Rs. three thousand after meeting his family expenses including a marriage ceremony and discharging the old debt. Of this he purchased lands worth about Rs. 1500 and is trying to have some more land with the balance in cash now with him. This is rather creditable for the boy who being still young has the whole responsibility on him. He has now taken more lands on lease and has kept four bullocks.

2. Venkatraman Subbraya Shetti of Murur, in Kumpta Taluka of North Kanara District.

This boy when he left the school was very young and none expected that he would at all undertake farming. But as he had joined the school on his own initiative, having an earnest desire for agricultural education, he naturally went back to his father's estate which consisted of only a few acres of land and has no facilities for growing crop like sugarcane. He therefore tried to secure a suitable piece of land for this purpose. As the boy is bold and also enterprising, he approached the Revenue Officers through the local Agricultural Officers for Government waste land, which he has now secured, though in an uninhabited and lonely place full of wild animals. Here he began his work single-handed with occasional outside labour which could be obtained with the greatest difficulty. For self protection, he first secured a gun license and then for the area fenced with wire fencing at a concession rate, both with the aid of the agricultural officers, who have much appreciated the boy's work and very much liked the boy. As he began to grow sugarcane, it

gave him good returns but the crop having grown tall began to lodge. This necessitated bringing of bamboos which are generally tied to support the crop in that tract. He therefore naturally sought the assistance of the Forest Officers for free grant of bamboos through the Agricultural Officers who have been helping and encourging the boy from the beginning. He secured bamboos for his purpose and thus continued his farming with greater enthusiasm and energy. He now cultivates chiefly paddy, sugarcane, coconuts and certain remunerative vegetables suitable to that tract. Making a humble beginning with practically no cash in hand, he is now worth a few thousand which he has invested in the development of his land and has thus increased its yielding capacity and its sale value.

3. Dundappa Patil of Adibetti, in Gokak Taluka of Belgaum District.

This is the case of a boy of fairly adult age (more than 18 years of age) when admitted into the school, as a special case. Soon after leaving the Agricultural School, he took up his farming and arranged to get the land clear of weeds by the use of improved ploughs, a few of which he purchased with a view to popularise them amongst the neighbouring cultivators on whom he had great influence being himself a Patil. After getting his own lands clear of weeds, he gave these ploughs to others either free or on nominal rate of hire, himself demonstrating the use and bringing to their notice the advantages. The demand for these ploughs rose to such an extent that he purchased some more ploughs for this purpose and made some money in this. But as this was not his chief business, he only paved the way for others to take up the work as a business which has now been taken at Gokak by his relative. This boy has also demonstrated practically on his land the advantages in the use of good seed, new varieties of crops, copper sulphate packets, proper spacing and necessity of proper mulching and so on. He has also been a moving figure in inducing the cultivators to join together for a pumping scheme on the bank of the Ghatprabha river. He has been of great use to the district agricultural staff in their propaganda work, as he has influence over the local people, and has the capacity of impressing well on the public.

4. **Giriappa Kanaka Raddy of Shelvasi, in Navalgund Taluka of Dharwar District.**

This boy comes from a very dry tract often liable to famine. This boy also dispensed with the services of the previous servant

and has been working with his father on the land. He has improved lands by bunding and has got lands clear of weeds mainly out of family labour and thus saving a good deal in this. Owing to improvement in land, he has been able to get at least some crop when others fail to get any thing. But as the rainfall has been of late very precarious it has been difficult to make both ends meet, not to speak of laying by any money. He has undertaken weaving as a sparetime job and weaves even *saris* for women though weaving had not been taught to him to such an extent. This has helped him to materially add to his income and make both ends meet owing to frequent famine there. Other people have also picked up weaving and have been benefited to a great extent. The boy has thus shown to the local people that improvement of land can be gradually taken up by family labour without spending money on this item to any appreciable extent and that some spare time job like weaving in precarious rainfall tract would be a very useful thing to add to the meagre agricultural income in such tracts.

5. Bharmappa Kademani of Hommardi, in Haveli Taluka of Dharwar District—

This is the case of a boy whose mother brought him to the Agricultural School; this boy has taken up his farming and by attending to improvement of land and other details and by growing remunerative crops like chillies, groundnuts, cotton and paddy, he has been able to lay by some money. His work is much appreciated by the surrounding public. He is also expert in weaving and arranges to weave his clothes as far as possible. But as he is the only worker, he does not find much time for this as he is required to attend to some agricultural operation or other. He undertakes his own implements' repair.

AGRICULTURAL PROBLEMS IN FAMINE AREAS

BY

RAO SAHEB B. P. VAGHOLKAR, L. Ag.

Deputy Director of Agriculture S. C. D. Poona.

(with kind permission of the Indian Broad-casting Company, Bombay.)

———():o:()———

Many of you must have known what is a famine area, but many must have not; and hence a short explanation about the famine area, its situation and peculiarities of soil, water and people would not be out of place.

The Agricultural definition of Famine Area is a zone or tract, which is affected from time to time with famine, which is caused by complete cessation of rains at usual time or insufficient rainfall falling in such a way as not to benefit the crops to grow to full maturity and allow a cultivator to reap full harvest. Such a situation is due to several causes; important of them are (1) zone not coming in the reach of regular monsoon current (2) want of forest to attract clouds and several other causes. It would not be out of place if I show you such areas in Bombay Presidency.

Divisions.	Districts affected by famine.
(1) Deccan ...	Ahmednagar, Sholapur, eastern half of Poona and Satara; and a small eastern portion of Nasik.
(2) Karnatak ...	Bijapur and eastern portion of Belgaum and Dharwar.
(3) Gujarat ...	Ahmedabad, Kaira and Panch Mahals (liable to famine from time to time).

If a more detailed information be required, I would ask you to refer to the Statistical Atlas of the Bombay Presidency for 1925 which will supply full information in detail.

As regards their situation you will see from the map, that these are far away from the mountainous tract and forests and hence no

rain could be regularly attracted. These tracts are always bare, without any tree growth of desired height.

The lands are found to be sloping very irregularly and the soils formed are in the majority of areas medium to poor quality and hence found to be less retentive of moisture. If the acreage is considered, the areas are very extensive but nearly $\frac{1}{3}$ to $\frac{2}{3}$rd non-crop producing lands could be found. With regard to water-supply as the rainfall is very limited and irregular, it is very scarce and the wells in fields have barely sufficient supply to irrigate crops for the whole year.

The population of cultivators is found to be no doubt the same or even more when compared to other districts, but as the soils do not supply sufficient crops, greater number of the population migrate for labour and very few stay and stick to their lands. Similar is the case with the cattle; because there is no sufficient supply of fodder. This being the real situation created by nature, the chief agricultural problems of such tracts are as under :—

1. Water supply.
2. Methods to get increased yields of existing crops and introduction of new strains of improved crop which gives better yield than the existing crop.
3. Fodder storage.
4. Financing cultivators for land development.
5. Secondary industries.

These problems are handled by several Departments and local bodies such as Irrigation, Revenue, Co-operative and Agricultural Departments and District Local Boards. In dealing with these, I shall deal mainly with the problems dealt with by the Agricultural Department in detail and shall just give you some idea of other departments who have dealt with other problems side by side.

1. *Water supply*:—This can be divided into following sub-heads :—

Water supply

(1) by canals,

(2) by wells,

(3) by bandhara schemes

(a) big and

(b) small.

Water supply by Canals:—This has been arranged by the Irrigation Department and you will find that Nagar, part of Poona and Sholapur Districts are being irrigated by the main four Canals-Nira Right Bank Canal, Nira Left Bank Canal, Godavari Canals and Pravara Canals–which have been constructed as protective works at a cost of over Rs. 5½ Crores. The area irrigated is about over 1½ lakh acres every year.

(2) *Water supply by Wells*:—Even though the area is irrigated by canals yet the proportion of this area to the extensive dry-crop area is very small and hence well-irrigation needs to be encouraged. In this connection, the Agricultural Department gives special concession for "Boring" and similar concessions are given on Tagai loan to cultivators for constructing new wells and deepening the same. Similarly the Bombay Government helps the cultivators to trace water for which the officer known as "Water Diviner" is appointed. If any body requires detailed information about these concessions, it can be had from the officers of the Agricultural Department and Revenue Officers of the District.

The supply of water by means of wells serves the cultivators as secondary industry and also carries them through famine by growing irrigated crops for themselves and their cattle.

(3) *Water supply by Bandhara Schemes*:—There are two types of Bandhara Schemes (A) big Bandharas and (B) small Bandharas.

(*A*)—*Water supply by big Bandharas*:—In Famine areas there are always abnormal falls of rain and when these fall flow down and are not useful, but are wasted. Hence, if these are prevented from running off, a regular storage is secured by means of Bandhara to a nalla or river and as a sequence (1) it can irrigate some area and the cultivators can take periodical crops and (2) it can supply sufficient water to wells below the Bandhara and hence the cultivators who have wells can also grow irrigated crops periodically and owing to these the cultivators round about Bandharas can safely go through the famine and can save their cattle.

For this purpose, a special Irrigation Section is opened under a Special Superintending Engineer who surveys such schemes and

undertakes the work for the people. The work done by him is summarised in a circular issued by the Director of Information, Bombay, on 24-2-28 :—

Till 1927, 1330 proposals were received; out of this surveys of 116 had been undertaken. Out of 29 projects 19 have been approved and 11 of these are under construction. The value of projects actually sanctioned and under construction is about 3 lakhs. The total estimated cost of all projects submitted for administrative approval is about 32½ lakhs. In all these projects, co-operation of cultivators is essential. For detailed report the above mentioned circular may be referred to. All works costing above Rs. 5,000/- are carried on by the Superintending Engineer.

(B)—*Water Supply by Small Bandharas* :—All works of similar nature but costing below Rs. 5,000/-are worked out by officers of the Agricultural Department known as Bunding Officers. There are two officers appointed, one for Deccan and one for Karnatak, and all help to cultivators is rendered by these officers. It would not be out of place if I just give you an idea of such a small scheme executed and the advantages of it to the cultivators. At Undewadi in Bhimthadi Taluka of the Poona District which is a famine-stricken tract such a scheme was designed and completed and the following is the description of that scheme:—

" At Undewadi village there were nearly 20 wells situated in a low-lying tract. Above these wells a good situation for bunding was traced. A bund 1,300′ × 12′ × 45′ of earth was suggested which would not allow the rainwater from the surface area of ½ mile × ½ mile to flow down. Thus accumulation of water in this area, after bund was put, would permeate through the substrata below, and supplement water supply in wells down below. These wells before the Bund was put, had only sufficient water, if there was good rainfall, to irrigate 30 to 40 acres of rabi jowar area and get a medium crop. But if there was no rain, the supply from these wells was scarcely sufficient for the village people and cattle throughout the year."

Realising the importance of the scheme from economic aspect of Bhimthadi Taluka, Rs. 750 were advanced in the first instance as Tagai by the Revenue Department to the cultivators of Undewadi Village for erection of bunds and the work was completed in August 1925. Thus the erection of bund was in time and soon after September and October rains, these 20 wells down below the bunds were in a position to grow in 1925-26 a crop of Jowar over an area of 90

Acres whose yield was bumper as against 30 to 40 acres medium crop and 20 acres in addition as summer crop. Later on Rs. 1950 were again advanced as Tagai for further work of the bund.

This will give an idea of how such works are useful in Famine area and help the cultivators. If more information is required and if any body wishes to suggest any schemes from their respective tracts the following officers may be written to :—

(1) The Deputy Director of Agriculture, South Central Division, Poona.

(2) The Bunding Officer, South Central Division, Agricultural College, Poona.

(3) The District Agricultural Overseers of the Districts concerned.

(4) The Mamlatdar of the Taluka concerned.

2. *Improvement of yield of existing crops and introduction of new strains which are high yielding* :—The most important improvements achieved are being demonstrated in this direction. The Departmental efforts during the last 20 years have evolved the following methods which can help the famine-stricken cultivators to get at least a secure crop and also 25 to 30 % more yield if he adopts them in growing a dry crop. These methods are :—

(1) Putting Bunds for the following purpose :—

(a) to stop surface washings of soil

(b) to allow rain water to be conserved.

(c) Thus to conserve more moisture to secure with the least rainfall a better crop.

(2) Deep tillage in time.

(3) Use of graded seed of jowar and bajri.

(4) Timely inter-tillage.

I shall deal with each point separately to show in brief how important and beneficial each item is.

(1) As said above, the lands are slopy and more area is non-crop growing. If the area to be actually under crop is bunded, all rain-water washings that fall on non-crop-growing area are collected on the bunded field and thus water after evaporation and drainage is

conserved, and is sufficient to the crop. This conserved water with light rainfalls later on allows the crop to grow better in the bunded fields and even in spite of scarcity the crop can be secured. Operation of bunding is being carried on by cultivators but many fail to do it in right direction and hence special Bunding Officers to advise cultivators have been appointed–one for the Deccan tract and the other for Bijapur tract. If any advice is required these officers may be consulted.

(2) *Deep tillage in time*:—Second factor after bunding is the *deep–tillage* i. e. ploughing the land deep with iron plough. This is quite essential in all bunded fields as it will hold more water than non-ploughed. As regards deep ploughing, attempts are being made by the Agricultural Department by starting an Implement Society and supplying implements in Nagar District. Deep tillage has been found to be beneficial.

(3) The third important factor is, *use of seed graded by sieves*. Cultivators try to use any sort of seed and hence failures in such tracts are much more. On Mohol Farm it has been found by experience that if the seed is passed through different sieves and the best seed is used for sowing, the average increase in yield of grain was 52 % and in fodder was 46 % over that of local seed. This has been very much appreciated and in Sholapur District a very large area was sown in 1928.

(4) The fourth and the last is the *timely inter-culturing* in the crop. Many cultivators fail to do this. But hand and bullock power hoes, if used, can secure better crops.

Thus, if only the above four methods are used by every individual cultivator nearly 20 p. c. increase in yield on the whole is possible and the expenses for these are very little. In this connection, more experiments on scientific basis are conducted by the Soil Physicist to Government of Bombay on the Dry Farming Station at Manjri.

As regards improved strains, attempts are being made to obtain good strains of the following crops:—

(1) Jowar
(2) Bajri and
(3) Wheat.

and the work is in progress and within a short period these will be found on field scale.

3. *Fodder Storage*:—The greatest scarcity is always of fodder and hence the cultivators in the famine tract cannot maintain bul-

locks. The District Local Boards and Revenue Department arranged to store fodder and sell either in cash or in the form of Tagai loan. The total quantities stored were :—

at Nagar.........over six Crores of lbs.

at Sholapur...about 1½ Crores of lbs.

In Bijapur and Belgaum Districts, fodder is stored by Fodder Storage Societies and Taluka Development Associations and also the Department has arranged to shred and bale fodder at Karajgi. This arrangement has brought down the general level of fodder rate in the tract and has made provision for cheap fodder to cultivators of famine area. Thus a great deal of money is saved of cultivators.

4. *Financing cultivators for land development and well-deepening.* It may be mentioned here that with a view to extending well irrigation in famine tracts, Government have ordered the grant of Tagai loan at a concession rate of interest viz. 10 pies in the rupee, when taken for sinking new wells or improving or repairing existing wells in all the Districts of the Central Division, (except East and West Khandesh) and in the Bijapur District of the Southern Division (G. R., R. D. No. 6019/24 dated the 19th May 1927) and similarly Tagai is freely advanced to undertake land development schemes such as Bunding etc. and the cultivators are making free use of it.

In Bijapur District the Collector, Mr. V. S. Naik, has arranged a Wilson Anti-Famine Institute through which the cultivators are supplied money, seed and advice.

5. *Secondary Industries*:—With regard to these attempts being made to start Weaving Schools, Poultry Industries, and Weaving Classes. Thus, so far I have given you a fair idea of Agricultural problems in Famine areas and how these are tackled and how different departments have been co-operating in making these successful and if any more information is required and if any suggestions are required to be given by any gentleman of the tract the officers concerned with the different departments may be written to and every action will be taken.

POULTRY AS A SECONDARY INDUSTRY SUBSIDIARY TO AGRICULTURE.

BY

H. G. BALUCH, B. Ag.

Manager, Agricultural College Dairy.

(With kind permission of the Indian Broadcasting Company, Bombay.)

At the very outset you may well remember, that the word poultry means the varieties of domesticated birds, that produce eggs and meat for human consumption; and it then, not only includes all the different varieties of hens but ducks, geese, turkeys and pigeons too.

In a vast country like India, where two-thirds of the population makes its living from farming, where the agriculturist depends on getting one crop a year due to limitation of water supply, where the present labour and unused farm stuffs are cheap, where the weather conditions are generally suitable for keeping poultry, it is therefore absolutely essential to have some sort of secondary industry as a subsidiary one to farming, so as to utilize their unoccupied time and unused material in producing something more to make comfortable living. One can think of many such secondary industries for instance, making yarn, weaving, rope making, and so on, but you would agree with me if I say that none of the above would be more profitable and a more fitting adjunct to the farming profession than that of keeping and managing a small poultry farm. The reasons for it as a secondary industry to the farmer are :—

First :—It requires a very small investment to make a successful start. A dozen or two high laying birds with ordinary neat and comfortable house and yard would cost him not more than Rs. 100.

Second :—The cost of rearing and maintenance would be practically a small amount as the farmer would be utilizing his surplus unclaimed grains from go-downs, threshing yard and the field-waste. Under strict city conditions even, the maintenance of a hen including everything works to three pies a day only.

Third:—The labour is very small and of a nature that all the members of the family, men, women, children, young or old, infirm or shirking from hard manual labour, can take part in it with ease and interest. Women or girls who often remain at home would best do this job, as they have the inherent trend to look after little details and observe cleanliness–the first two key–notes in successful poultry keeping. One person can easily manage two dozen fowls.

Fourth:—It starts giving returns on the very day and every day throughout the year. Steady income and every day means profitable occupation and credit with neighbours. Two dozen hens managed by one person would give one dozen eggs a day worth ten annas.

Fifth :—It is an aid to crop returns in a way that the poultry manure adds to soil fertility, that birds pick up all weed–seeds, catch and eat all the injurious insect pests found in the field on the crop and animals, even the scorpions, millipedes and young snakes which are dreaded enemies of the farmer are tackled and eaten by them.

Sixth :—It is an industry the products of which are very little affected by the competition and slump of the distant and forgein markets. Even if the produce is unsold at any time, it can be economically utilized in the house-hold for bringing up bonnie babies and robust parents.

Seventh :—It is a very healthful, interesting and invigorating occupation.

It has only two disadvantages and one that it requires constant attendance the other is the often unwarranted fear expressed of having an outbreak of contagious diseases and heavy casualities inflicted thereby. This latter is wholly due to inattendance and negligent management.

The ancient history of India as gleaned from Puranas and Vedas traces that the domestication of the fowl had its origin here ; and later it got distributed to other lands. Since then the fowls seem to have been maintained as an unaccounted incident, the birds living on any accidental food or refuse as they picked up in the free range, drinking any dirty water they got, having no protection from the fatal attacks of their enemies except during night when they are shut up in an insanitary mud-made dungeons ; and up to the present time even, the breeding has been very indiscriminate one, proper feeding has been neglected and no attention has been

given during their ill-health. The only fowl that seems to have received any care was the game bird Asil for its exciting fighting qualities. The present Indian fowl is nondescript, miserable ill-looking and undersized bird; it weighs 1 to 1½ lbs only, starts laying at the age of seven months, and lays sixty eggs a year of unattractive appearance and tiny size 1 to 1½ oz. in weight; while its original migrated sisters of western countries under systematic management, now weigh 4½–7 lbs., start laying after 5 months and lay yearly 175–240 eggs of very attractive appearance, and huge size of 2½ to 2¾ ozs. each.

Apart from the above deplorable circumstances of the stock, the system of marketing Poultry produce if any, has been and yet is in a very unorganised state, and in the clutches of illiterate persons who buy eggs at one or two pice each and sell them at one anna each. Their methods of colleection, handling, transport, storage and distribution are very crude, faulty, insanitary and expensive.

In other countries the poultry industry as a subsidiary or specialized one has progressed to an unimaginable success. The 1922 statistics of United States of America show that there has been 600 crores of rupees worth poultry produce more than their wheat production, and that little country like Denmark with one crore acres of cultivable land, in other words ⅙th of cultivable area of our Bombay Presidency, produces annually 4½ crores Rs. worth poultry produce and exports eggs worth more than 2½ crores of rupees, while this very tiny country sixty years ago exported 27000 Rs. worth poultry produce. Even the backward country like China exports nearly 4 crores of rupees worth eggs in a dry and liquid form.

You may now be inquisitive to know what is the underlying cause of such big national income of those countries and what might be the basic factors which are responsible for such a success in poultry as an industry there.

It is due to no mysterious cause but that of conducting the industry with proper knowledge, practice and organization as a secondary occupation subsidiary to agriculture.

Those factors can be summed up in three cardinal rules.

First :—Training in the science and practice of poultry culture including breeding on right lines, rearing and feeding on rational basis, comfortable housing and proper care during their illness.

Such training facilities are available at the Government Central Poultry Breeding station attached to the Agricultural College Dairy, Poona.

Second :—Making a start with best foundation stock of high capacity laying hens and breeding cocks from well acclimatised layers giving not less than 150 eggs a year and above 2 ozs in weight each. Such birds would not cost more than Rs. 5/- per pullet and can be obtained from the Government Central Poultry Breeding Station at Poona.

Third :—Improved ways of marketing from the producer to consumer are essential for this industry also. These can easily be brought about by joint co-operative efforts through the help of Co-operative Department.

Rough estimate of expenditure and income to a cultivator keeping two dozen birds of a good breed as a subsidiary occupation.

			Rs.	As.	Ps.
A. Capital cost:—	(a)	Birds.			
	1.	Cost of one pen i. e. four hens and a cock 5 Rs. each.	25	0	0
	2.	Hatching and rearing to make up 24 hens and four cocks within six months, 4 Rs. a month.	24	0	0
		Total cost of birds.	49	0	0
	3.	Deduct returns from extra eggs not hatched, 200 eggs 10 annas per doz.	10	0	0
		Approximate expenses on birds.	39	0	0
	(b)	Housing, yard and appliances.			
	1.	House 12′ by 8′ made from babul posts tarred, corrugated iron sheets roof sloping on one side enclosed with 1″ mesh wire netting with two tick-proof perches and one door.	20	0	0
	2.	Yard. 24′ × 48′ on either side of the house. 5′ high with 1″ mesh wire net; 24 babul posts tarred.	25	0	0
	(c)	Miscellaneous appliances: 4 water fountains and four hoppers.	12	0	0
	(d)	Fixing up :—	4	0	0
Total Cost including birds, housing etc. comes to Rs.			100	0	0

The farmer's liabilities would therefore be not more than Rs. 17/-a year including 7 p. c. interest and 10 p. c. depreciation.

B. Annual running expenses·—Food and labour.

Food at 2-8 Rs. a bird per annum.	75	0	0
Labour put in by his members of the family at Rs. 5/-a month.	60	0	0
Total running cost comes to Rs.	135	0	0

Annual Income :—From eggs alone. 150 eggs per bird for 84 birds at 10 annas a doz.	187	0	0

C. The farmer's gross income in return for his family labour and farm waste feeds would therefore amount to Rs 160.

This sum of Rs. 160 a year is farmer's gross income from his two dozen poultry kept as a secondary occupation subsidiary to Agriculture.

THE MANGO INDUSTRY IN THE KONKAN AND ITS FUTURE.

BY

P. V. WAGLE, M. Ag.

Mango Investigator, Ratnagiri Farm.

———():o:()———

The mango is the premier fruit industry of this Presidency, and particularly of the Konkan. The cultivation of this fruit crop is known from time immemorial, but the real improvements in the methods of cultivation and the varieties seem to have been effected by the Portuguese after their conquest of Goa. The very names of some of our best varieties viz. the Alphonso, the Pairi (from Pereira)

and the Fernandin suggest that they are of Portuguese origin. It is these varieties, principally the first one, that form the basis of this commercialised industry, from the taste, flavour, keeping quality, colour, etc. of the fruits. The Alphonso is said to have been introduced in the Konkan at Ratnagiri in the latter part of the last century, so that the oldest grafts appear now to be about 60 to 70 years old. No reliable history of the introduction of these grafts is available. The grafts grew vigorously in the well-drained laterite soils and the hot and moist climate of Ratnagiri. They bore excellent crops of fruits, the best ever known. This induced the people to go in for these choice varieties. Enarching, one of the simplest methods of grafting, was brought into use. Almost every cultivator had a few grafts growing in his compound. But the tendency of growing this fruit tree on an extensive scale in regular plantations is more or less of recent date. Not more than 25 or 30 years ago, the people began to feel that this fruit could very well stand transport to long distances and with regular steamer communication at their service could ship their fruits to the Bombay market where they found a ready sale. To add to this the adaptability of these grafts to the poor and cheap *varkas* lands helped the spread of these plantations. It was thus that the foundation of the great industry was laid in the Konkan. An idea of the rapid increase in the acreage under this crop in the Konkan can be clearly formed from the following figures :—

Acreage under mangoes in the Konkan.

Year	Area
1921-22	4181
1924-25	9478
1926-27	115[illegible]8

With the steady increase in the number of plantations, the production of fruits also gradually increased and there appeared on the scene the merchant class or contractors who found it a profitable business to get into the trade. As soon as the fruits were ready, they purchased them from the growers, packed them and despatched them to Bombay for sale through their *dalals* (commission agents) in the Bombay market. This business of only two or three months' duration and of little investment left them a wide range of profit, as

could be made out from the ever-increasing number of these traders that were attracted year after year. In course of time, their number increased so much that there was keen competition among them and the prices of the gardens began to rise. The gardens were purchased at flowering time or even before, simply from the colour of the foliage instead of when the fruits were mature. This practice at times brought the merchants into severe loss due to the absence of blossoms or to their being damaged by insect pests and diseases which are also on the increase on account of the unsystematic plantations. The rough handling of the exceedingly large number of parcels by the steam companies was the cause of the loss of some of the inside fruits during transit. The Bombay *dalals* also began to take the lion's share of the profit Thus the mango industry which was once considered to be very safe has become a very risky business. To make matters worse, the acreage under this fruit crop is so fast increasing that within the next 10 to 15 years, it is quite likely that the business will no longer pay, like the sugarcane cultivation on the Deccan canals. The effects are already being felt, for, in years of bumper crop, the Bombay Market is being regularly flooded with mangoes which the *dalals* find very hard to dispose of. Thus, unless the whole business is reorganised on the proper basis, the whole industry is likely to die. The following are some of the lines on which the organisation will have to be achieved.

1. *Practising intensive methods of cultivation.*

The present tendency of the people of simply multiplying the plantations should be checked. In several instances proper selection of the site and of grafts is not made. They are also planted too close, with the result they do not bear properly or are badly attacked by pests and diseases. It is best to have a few plantations systematically planted and well looked after than a large number of neglected ones which require more investment and bring in less profit. Moreover if the number is limited, there is scope for increasing the yield considerably by proper manuring and treatment of pests and diseases.

2. *Proper control of pests and diseases.*

The mango hopper pest and the mildew take a considerable toll of this crop almost every year. The damage done varies from 25 per cent in a good year to about 75 per cent when the attack is bad. By the proper treatment of the diseases much of this can be saved.

3. *Better methods of packing and handling fruits.*

Most of the fruits are now shipped in flexible bamboo baskets which on account of the rough handling by the steam companies

receive injuries, thus damaging the inside fruits. This loss at times is as high as ten per cent. This can be avoided by the use of light and cheap wooden packing cases specially prepared for the purpose. Proper ventilation has to be provided if the fruits are to stand long journeys. Arrangements should also be made with the steamer companies for the proper handling of the parcels.

4. *Better organisation for marketing.*

The mango merchant is at present entirely at the mercy of the Bombay *dalal* as the selling of fruits is not done by open auction but under cover. Neither the merchants nor the buyers know any thing about the actual terms. Thus the merchants and the growers are at a considerable disadvantage for the *dalals* eat away considerable share of the profit. Unless the whole question of marketing is properly organised on a co-operative basis the industry is bound to suffer.

5. *Exploiting of other Indian as well as foreign markets.*

So far, Bombay is the only market which receives mango fruits from the Konkan. As the season is almost the same throughout the Konkan districts, the market is very often glutted. It is, therefore, highly necessary to open other markets in India as well as abroad. Alphonso is a variety which has excellent keeping quality and will hence stand transport to long distances provided it is properly packed and carefully handled. With the opening of air-ship service in the near future, it may probably be expected that this industry will receive considerable encouragement.

6. *Preservation.*

Though this is an important line for the development of this industry, very little work is being done in this direction. We have at present hardly 3 or 4 factories which have been doing preservation work on a small scale. Even our present production in some years as in 1925 is so much that it is hardly possible to meet the picking and packing charges from the cost realised. The situation is bound to be worse and worse year after year as the area under this crop is fast increasing. Preservation of the fruits in different forms practised on a large scale both for the local as well as the foreign market is sure to save the situation and place the industry on a firm footing.

PROBABLE EFFECTS AND EXTENT OF DIFFERENT COMPONENTS OF SEED COTTON ON GINNING PERCENTAGE OF LINT.

BY

D. S. SHETH, B. Ag.

Assistant to the Cotton Breeder, South Gujarat, Surat.

———():o:()———

Seasonal variations are invariably found in the produce of all crops; but when a particular character is a combination of several other minor characters which are affected by environment, one has to investigate the effects of general environment, on these minor characters first and then and then only one can look to the probable causes of the variations in the main character.

Ginning percentage is the weight of lint per weight of seed cotton expressed in percentage.

Again the weight of lint and seed cotton are composed of the following characters :—

(1) Weight of lint per seed :—

(i) no. of lint hairs.

(ii) weight of each hair.

Again the weight of each hair depends on its length and its thickness or the materials composing the hair.

(2) Seed cotton = weight of lint + weight of seed.

Therefore the following factors tell upon the ginning percentage :—

A. Weight of lint :—

(i) number of lint hairs per unit surface of seed.

(ii) length of staple.

(iii) thickness of hair and its composition.

B. Weight of seed :—

It is very difficult to separate statistically the effects of length and the other weight factors of each hair.

(i) Number of lint hairs per unit surface of seed :—

It has been observed that even in cases of want of fertilization as in the case of specks (i. e. undeveloped seeds i. e. ovules) in seed cotton, short lint hairs in ovules are found. This indicates that number of lint hairs is largely determined before fertilization takes place.

When the number of seeds in a boll is extremely low, the number of lint hairs per seed is also low. This indicates that condition of all the ovules brought about by environment and physiological causes before fertilization, determines the number of hairs on seeds. However it is very difficult to measure this character statistically, but by grading it can be seen by spreading out seed cotton and feeling the number of hairs.

(ii) Length of staple :—

We have got the exact measurement of lint length of the last five years of a pure type 1027 A. L. F. by Balls Sorter and we can judge to what extent the effect of lint length on ginning percentage will be.

The following table shows the length of staple in inches and the actual ginning percentage :—

Year.	Length of staple in inches	Ginning p. c. of lint.	
1923–24	1·00	35·9	
1924–25	0·95	35·8	
1925–26	0·92	36·6	
1926–27	0·97	35·3	
1927–28	0·94	34·6	

The following table shows the average percentage increase or decrease in the length of staple (compared with that of ginning percentage) :—

% increase or decrease of		Length of staple.	Ginning %.
1923–24 Over	1924–25	+5·0	+0·27
	1925–26	+8·0	–1·86
	1926–27	+3·0	+1·67
	1927–28	+6·0	+3·62
1924–25 Over	1925–26	+3·1	–2·23
	1926–27	– 2·1	+1·39
	1927–28	+1·05	+3·35
1925–26 Over	1926–27	–5·43	+3·55
	1927–28	–2·17	+5·46
1926–27 Over	1927–28	+3·09	+1·98

In five cases out of ten the effects of increase in length is seen in the increase in ginning percentage.

From this it appears that the effects of length of staple are visible only in a few cases and in others it is totally eclipsed or reversed by some other components.

The actual effects when worked out in all comparisons for 1925-26 are as under :—

Year of comparison with 1925–26.	Length of staple.	Ginning p. c.	Difference in p. c.
1923–24	+ 8·0	– 1·86	9·86
1924–25	+ 3·0	– 2·23	5·33
1926–27	– 5·53	+ 3·55	9·08
1927–28	– 2·17	+ 5·46	7·63

(iii) Thickness of hair and its composition :—

As we examine a boll which has prematurely opened say, after one month's development or so (i. e. under wilt attack condition or any similar condition) we find lint fully developed in length, but all the hairs are extremely weak. This observation indicates that lint length develops within a month while the strength i. e. the thickness or the composition of each hair giving strength develops later on. This is in accord with the observation of Balls with Egyptian Cotton.

Average lint hair weight per inch :—

This is affected by lint length, lint diameter and its composition.

This has been taken from the results kindly supplied by the Director., Technological Laboratory, Matunga, they are as under:—

Year	Fibre weight per inch. Ten millionth of an oz.	
1926–27	2·01	
1927–28	2·03	

This character varies greatly with the dry or wet season; diminished water supply increases lint hair weight per inch and *vice versa.* In 1927–28 Punjab Cottons had as determined by the Director, Technological Laboratory, Matunga, much increased fibre-weight on account of diminished water supply while *Wagad* cottons had much reduced fibre weights on account of the occurrence of the flood in the Dholleras tract.

The combined effects of all the above three components of lint weight have been as under:—

The following table shows the lint index—

1923-24......39·3
1924-25......35·4
1925-26......34·0
1926-27......35·9
1927-28......33·3

The following table shows the average percentage increase or decrease in lint weight per seed (compared with ginning percentage):—

% Increase or decrease of		Lint weight per seed	Ginning percentage.
1923-24 Over	1924-25	+9·9	+0·27
	1925-26	+13·4	-1·86
	1926-27	+8·6	+1·67
	1927-28	+15·2	+3·62
1924-25 Over	1925-26	+4·0	-2·23
	1926-27	-1·4	+1·39
	1927-28	+5·9	+3·35
1925-26 Over	1926-27	-5·6	+3·55
	1927-28	+2·0	+5·46
1926-27 Over	1927-28	+7·2	+1·98

In six cases out of ten the effects of increasing lint weight is seen in ginning percentage. Out of the remaining four cases, in three it is due to the comparison of 1925-26, an abnormally dry season, due to which lint weight was very low, though the weight of each hair was probably high, i. e. a number of lint hairs was low in association with very low seed weight, thus the ginning percentage was opposite to lint weight per seed owing to the disproportionate increase in seed weight in proportion to lint weight.

By comparing this table with the previous one it will be seen that in nine cases out of ten, the effects of lint length are similarly reflected in lint weight.

B. Weight of seed:—

The following are the figures for seed weight in Milligrams:—

1923–24......68·4
1924–25......62·5
1925–26......58·0
1926–27......65·8
1927–28......63·0

As explained previously, the ginning percentage is the ratio of lint weight to the combined weight of lint index and seed weight and as we discussed lint weight and its components, now it is necessary to discuss the effects of seed weight on the ginning percentage.

The following table shows the average percentage increase or decrease in seed weight (compared with ginning percentage):—

% increase or decrease of		Seed weight	Ginning percentage.
1923–24 Over	1924–25	+ 8·6	+0·27
	1925–26	+15·2	−1·86
	1926–27	+ 3·8	+1·67
	1927–28	+ 7·9	+3·62
1924–25 Over	1925–26	+ 7·2	−2·23
	1926–27	− 5·3	+1·39
	1927–28	− 0·8	+3·35
1925–26 Over	1926–27	−13·4	+3·55
	1927–28	− 8·6	+5·46
1926–27 Over	1927–28	+ 4·2	+1·98

In six cases out of ten, the effect of increase or decrease in seed weight is reflected in the decrease or increase in ginning percentage respectively.

Now if we compare all the three characters viz. number of lint hairs, length of staple, lint weight, and seed weight taking lint weight as the basis for comparison, we can easily grasp the differentiating effects of each of these on the ginning percentage.

Year.	Ratio of increase or decrease in % of lint length to lint weight		Ratio of increase or decrease in % of seed weight to lint weight.		Ginning %.
	Length of staple	Lint wt. per seed	Seed weight	Lint wt. per seed	
of 1923–24 over 1924–25	+0·5	+1	+0·87	+1	+0·27
1925–26	+0·6	+1	+1·1	+1	−1·86
1926–27	+0·35	+1	+0·44	+1	+1·67
1927–28	+0·4	+1	+0·52	+1	+3·62
of 1924–25 over 1925–26	+0·8	+1	+1·18	+1	−2·23
1926–27	−1·5	−1	−0·28	+1	+1·39
1927–28	+0·17	+1	−0·12	+1	+3·35
of 1925–26 over 1926–27	−0·96	−1	−2·4	−1	+3·55
1927–28	−1·05	+1	−0·81	+1	+5·46
of 1926–27 over 1927–28	+0·43	+1	+0·58	+1	+1·98

In six cases out of ten the ratio of length of staple to lint weight varies from 0·35 : 0·6 while in all other cases, the ratio of length of

staple to lint weight is higher i. e. the lint weight is proportionately less in weight. All these cases are of comparisons made with 1925-26 and one of 1924-25.

The following are the figures for the actual length of staple in inches and lint weight:—

Year	Actual length of staple in inches.	Lint weight.
1923-24	1·00	39·3
1924-25	0·95	35·4
1925-26	0·92	34·0
1926-27	0·97	35·9
1927-28	0·94	33·3

The following table shows the high ratio of increase or decrease in percentage of lint length to lint weight from the above table :—

	Length of staple	Lint weight per seed.
1923-24 over 1925-26	+ 0·6	+ 1
1924-25 over 1925-26	+ 0·8	+ 1
1926-27 over 1925-26	- 0·96	- 1
1927-28 over 1925-26	- 1·05	+ 1
1926-27 over 1924-25	- 1·5	- 1

The season 1925-26 was a very dry season and naturally the fibre weight per inch should be increased as described previously.

In the above table we get a higher ratio of fibre length to lint weight i. e. the weight is less even though the average hair weight

K

ought to be high due to dry season i. e. the aggregate lint weight of all the hairs should be high. Thus the number of lint hairs, the only remaining components of lint weight must be low in that season. This is also quite in accord with the general correlation found between seed weight and lint weight per seed.

The one case found for 1924-25 comparison can also lead to the same conclusion viz. the low seed weight of 1924-25 reflecting in low lint weight as they are correlated.

In a dry year the seed weight will generally be very low as in 1925-26, yet the ginning percentage will not be adversely affected, as the lint weight is decreased due to the decrease in the number of lint hairs as a probable result of less lint-bearing surface and shortness of lint length, though each lint hair is heavier (but not to the extent of counterbalancing the other two factors). But if the conditions be favourable for the increase in seed weight at the time of boll maturity, the ginning percentage may be high due to proportionately greater lint weight because of increase in the number of lint hairs (i. e. lint-bearing seed surface) and also lint length as in 1923-24.

In an ordinary rainfall year with unfavourable condition at the ripening time as in 1927-28, when the seed weight is increased more in proportion to the increase in lint weight, the ginning percentage will be lowered though the absolute seed weight will be much decreased in comparison with other years.

FOOD SUPPLY IN THE BOMBAY PRESIDENCY.

BY

K. S. KULKARNY, B. Ag. AND H. M. DESAI, B. Ag.

Lecturers in Agriculture.

———():o:()———

It is now-a-days so commonly read in papers and heard in public lectures that on an average the Indian, taking the country as a whole, suffers very much from insufficiency of food. It is again not uncommon to find cases specially among the rural population of men, women or children very often getting only one meal a day instead of three to properly and efficiently cope .... the nature of work they are required to do. That there is a general deficiency of food supply is a matter on which there seems to be a consensus of opinion. It is therefore proposed to examine this question a little more in detail with the help of such published statistics as are available, at present so far as the Bombay Presidency (including Sind) is concerned.

The factors one has to consider, in discussing and bringing into relief this all-important question of food supply are briefly detailed below :—

A. The population of the Presidency (excluding Native States)

B. The total requirements of food grains.

C. The total area under what may be called food crops.

D. The produce obtained from all these areas.

E. The probable losses out of and other demands on this total production.

F. How far the net available food grains are sufficient for the existing population.

Let us now examine the above factors one by one.

A. *Population*: According to the census figures (1921) the total population of Bombay (including Sind and Native States) is 26·8 million souls. Of this the Native States show 7·5 millions leaving for

the British districts a total of 19·3 millions (vide Statistical Atlas, Bombay Presidency, 1925.)

The proportion of males to females is roughly half to half. This means that there are about 9·65 million males and 9·65 million females. From the point of view of distribution of this population by two ranges of ages, the census figures indicate the following proportion for every 1000 persons :—

Age range.	*No. of males.*	*No. of females.*	*Roughly.*
0–15 years	382	389	400
15 years and over	618	611	600

Assuming that males and females are equal, the above age range figures will work out for the actual population as below :—

age range.	males and females.
0–15 years.	7·7 million souls.
15 years and over.	11·6 "
Total	19·3 "

B. *Requirements of food grains*:—By the term "food" we mean for the purpose of this discussion, all the cereals and pulse grains only, leaving such other food-material like fruits, vegetables, sugar, spices &c. as being only supplementary and not the main diet of the generality of the population.

From enquiries made in several places, as also from what Mann and Kanitkar say (in their *Land and Labour in a Deccan Village*—study No. 2, 1921) it may be safely taken that a man requires about 30 ozs, a woman about 24 ozs, and a child about 18 ozs of food grains per day. The word child includes persons below and up to 15 years of age. The above quantities stand as requirements for the working class people. But such people form the bulk of the population. The higher class people would require generally a little less food than those of the working classes. But the percentage of wastage among the former classes is also considerable. For purposes of this note, therefore, it is taken for granted that on the whole, the total consumption of food grains for all classes of the whole population would be about the same.

Taking for every 1000 persons, children to be about 400 and males and females each at 300, the proportion of the population could be divided as under :—

(1) Children i.e. up to 15 years	7·7	million souls.
(2) Males—over 15 years	5·8	"
(3) Females— "	5·8	"
Total	19·3	

For the above, calculated at the food requirement figures mentioned already, the annual consumption would run into :—

(1) $7{\cdot}7 \times 18 \times 365$	...	1·4	million tons for children
(2) $5{\cdot}8 \times 30 \times 365$	...	1·8	" " males
(3) $5{\cdot}8 \times 24 \times 365$	...	1·4	" " females
Total		4·6	million tons.

One more point in this connection may be referred to here. Though, as a whole, everyone eats food grains daily, there is likely to be some saving of such grain on account of the fact that a certain proportion of the population utilize flesh as their food. Flesh-eating, if taken generally, is not resorted to daily or even as frequently as to be anything so very considerable. It is usually in the bigger cities that flesh-eating, is at all important. In the rural areas flesh-eating, by whatever class of people it may be, is generally on special occasions and on a few days in a year. The rural population forms really the bulk of the mass of people and hence it is doubtful if the factor of flesh food would be at all anything so big as to really affect the above calculation. We shall however refer later to this point again.

C. *Area under food grain crops* :—The figures of normal acreage under dfferent food crops (1916–17 to 1922–23) as shown in the *Season* and *Crop Report of the Bombay Presidency* are as under :—

Crop	*Acres*
(1) Jowar	85,00,000
(2) Bajri	52,68,000

Crop	*Acres*
(3) Rice	30,63,000
(4) Wheat	21,83,000
(5) Gram	7,66,000
(6) Other cereals and pulses	28,74,000
Total	2,26,54,000

The years 1916 to 1922 include a few years before and after the latest census.

D. *The total production of food grains* :—The total production of cereals and pulses during the above years, as given in the season and crop reports of the Bombay Presidency appears as under :—

Year			*Production*	
1916–17	...	...	6053244	Tons.
1917–18	...	...	5240017	„
1918–19	...	...	2679735	„
1919–20	...	...	5874842	„
1920–21	...	...	3735954	„
1921–22	...	...	5301375	„
1922–23	...	...	5258820	„
		Total	34142987	
		annual average	4877712	

or roughly 4·9 million tons per year.

E. *Other demands or losses*:–It must not be, at this stage, forgotten that the above figures of production are, when all is said and done, more in the nature of estimates of actual standing crops than exact weights taken. One must therefore consider all the probable losses which would generally occur till the grain actually reaches the consumer. A certain amount of grain is utilized for feeding cattle-milch or otherwise. Then there is a series of variety of sources of loss such as birds in the fields, untimely rain and rat trouble on the threshing yard, and the large number of stored grain insect pests which are all responsible for a tremendous loss of the produce either before or after harvest. It is very difficult to estimate the losses caused by

these various factors. Birds alone have been reported to cause losses ranging from 5 to 20 per cent in different years. The distruction of grain in stores either with the farmer or the merchant is not at all inconsiderable. Taking all these into consideration, we believe we would not be erring much on either side, if we take the total loss at about 10 per cent at the least i. e. 0'49 million tons. Under B above, we have referred to the question of flesh-food and though we expressed our doubt as to whether at all, under the present conditions mentioned therein, the saving in food grains by flesh eating was anything worth much consideration, we propose to offset this saving by leaving out of consideration half of the above loss of 0·49 million tons. The other source of loss of food grain is the utilization of part of the produce for next year's sowing. Calculating at 8 pounds per acre for jowar and bajri each, 60 pounds for rice, 40 pounds for gram and wheat each and 10 pounds for other cereals and pulses the total demand for sowing purposes runs into 0'2 million tons. We are not taking into account the extra quantity that may be required-and in many places it is required-for second sowing in case the first sowing fails.

Taking both these items, the total quantity of food grains that will not be available for human consumption will be roughly 0'45 million tons.

F. *How far the net available food grains are sufficient for the existing population* :--

(1) Under B. above we see that the total requirement of food grains for the population is ...4'60 Millions tons

(2) From D and E above we find that the net available food grain for food purposes comes to 4'45 Millions tons

Thus there is a clear deficit of 0.15 million tons every year which works out at 24 oz of food grains per head. This comes to mean that 600,000 souls will have to go without food or in other words there is a deficit of about 3 p. c. of actual requirements. This may of course be taken as within the error of calculation. It would seem therefore that so far as this Presidency is concerned the annual total requirements and the annual production of food grains equalise each other.

ARBOR DAY.

BY

L. B. KULKARNI, M. Ag.

Assistant Economic Botanist, Agricultural College, Poona.

—————:):o:)—————

Before going direct to the subject matter, I shall first introduce you to the subject so that you may better understand and realise the importance of it.

Great famines are now fortunately rare, but local scarcity is not uncommon. Due to one or many reasons such as entire failure of the season, scanty rains, untimely rains, excessive rains causing flood like what we had in Gujarat in 1927, besides epidemics and other causes. It is needless to say that the Agricultural Department is trying its best to improve the conditions.

Water is the most essential factor in the success of growing crops; and this is generally met in the form of rains. Our farmers also know that with good rains crops are better. So far it has been found difficult to forecast and control season. Under such circumstances, the only means to better the conditions are firstly to increase the moisture-absorbing elements, secondly to preserve the moisture and thirdly to use it economically. The last two means are being successfully practised and also advertised by the Department. But it is the first one I am dealing with in this paper.

It is a known fact that the climate of a treeless tract is hotter than that of a place overgrown with trees. This means that trees change the climate, by absorbing the rain water by means of their roots and preserving the same in subsoil, which might be utilised in growing not only better crops but also variety of crops. Such is the importance of trees.

During my sojourn in the U. S. A. in 1924, I had an opportunity of attending the ceremony of an Arbor Day in one of the states and was quite impressed by the method of displaying untiring energy and enthusiasm by the young as well as the old. I am giving in brief the details of the Arbor Day which means a tree-planting day. Such festivals are probably as old as civilisation. Sacred trees, groves, shaded academic walks and memorial trees are common.

Arbor Day as such is purely American in origin and grew out of conditions peculiar to the great plains of the west, a country practically treeless over much of its area. It was first observed in Nebraska in 1872. The U. S. Secretary of agriculture introduced in one of the meetings of the year 1872, a resolution that the 10th day of April 1872 be especially set apart and consecrated to tree-planting in the state of Nebraska. The resolution was adopted and prizes were offered to the country agricultural societies and to the individuals who would plant the greatest number of trees. Wide publicity was given to the plan and over a million trees were planted in Nebraska on the first Arbor Day. This day is being celebrated in Nebraska with enthusiasm from its very beginning to the present day.

Kansas and Tennessee followed the lead of Nebraska in 1875. Next year 1876, Minnesota fell into the line, In Kansas, the same treeless condition existed as in Nebraska and this plan of immediate economic importance was adopted. In 1882. Two more states, Dakota and Ohio began to celebrate the day.

The first celebration of the arbor day in Ohio, took an entirely new form at the suggestion of the president of the Ohio Forest Commission. Under the directions of the superintendent of schools, the school children of the city, had a prominent part in the celebration which included a parade through streets where trees were planted in memory of the distinguished men. About 2000 children participated in singing and putting soil round trees already planted. The day was observed as a school festival and the practice of planting memorial trees and groves was inaugurated. Tree-planting by school children became a festival combining pleasure, utility and instruction. Thus one of the greatest benefits of the observance of the Arbor Day has been in its effects in impressing on the minds of the young people, the value of trees and the necessity of conserving the resources of the country.

In 1883 the American Forest Congress passed a resolution recommending the observance of an Arbor Day in the schools of every state and a committee was appointed to demonstrate to school authorities the value of the celebrating an Arbor Day and a resolution was passed in 1884. It runs as follows :—

" That in view of the valuable results of the Arbor Day work in the six states where such a day has been observed by the schools, this association recommends the general observance of an Arbor Day for schools in all our states."

As a school festival, the observance of the Arbor Day gradually spread not only throughout the whole of U. S. A. but also beyond its borders. In 1895, the plan was adopted officially in Spain. It reached Hawai in 1905 and is now in vogue in all the dependencies of the U. S. and in Great Britain, Canada, Australia, British West Indies, South Africa, New Zealand, France, Norway, Russia, Japan and China.

In 1922 the golden anniversary of the Arbor Day was commemorated by President Hardinge urging the Governors of the various states to set apart a week in April from the 16th to 22nd as forest-protection week and the last day of that week as the golden anniversary of the Arbor Day and requesting officers of the Public Instruction of countries, cities and towns and also of civic and commercial organisations to unite in thought and action for the preservation of common heritage by planning such educational and instructive exercises as shall bring before the people the disastrous effects of the waste of the forest fires and the need of individual and collective efforts to conserve the forest and increase the tree-growth.

In more than half the states, the law has been enacted for the observance of an Arbor Day. In the others and several other territories, the day is observed by proclamation of the Governor, authorisation of the Superintendent of Education or by some such arrangement.

An essential part of the programme of the Arbor Day is the assignment of subsequent care of the trees to individuals or organisations such as boy-scouts, schools, civic associations or such other bodies. Then only the purpose of planting is achieved. It is not enough to plant a tree and sing a song. Some one must see that it gets water, light, soil, manure etc. which are necessary for its growth.

In the half century since its first celebration, the Arbor Day has become firmly entrenched in the American country. The spirit of the day is unique in that it looks not backward but always forward. It directs the eyes of all not towards some achievement of the past but to a goal to be achieved in the future. It carries with it the inspiration of work towards betterment of the community, the state and the nation.

Detailed information regarding planting, care of trees is freely given free of cost to the public in the form of various publications.

What can we do in India? The spirit can be infused into the minds of school-going children, and the importance and value of trees

should be explained to the authorities of the schools and other institutions. The authorities of various departments especially the Revene Department may be approached for the grant of places for planting trees. The Forest and the Agriculture Departments should cooperate for furthering the progress.

The Collector of Bijapur has recently started the work and put in thousands of seeds during the last season in consultation with the Agricultural Department and in cooperation with other departments. The action is probably the result of the discussion the writer had with the Collector during the last year.

I was told that in 1876, Mr. Ashburner—the then Collector of West Khandesh ordered every municipality to plant trees along the roads and the people are now enjoying the shade.

Many people are under the impression that trees increase rainfall. This is not so. They preserve moisture and cool the climate.

The following advantages are derived from trees :—

1. Most of the rain water falling on the slopes of hills is retained by the roots of the trees. This moisture in the absence of trees, is washed away with the surface soil into the rivers, lakes and springs down below, causing floods.

2. With the moisture preserved in the subsoil, water level is raised and rivers, lakes, and springs are kept running constantly.

3. With the increased moisture in the soil, better crops are grown in spite of low rain-fall.

4. The timber supply which is the national resource of wealth is increased.

5. The climate is cooled especially in summer.

6. Cities and towns are beautified with the ornamentation of trees.

7. Last but not the least is the educational value of trees given to the boys and girls of various institutions.

THE U. T. C. CAMP OF 1928.

BY

2nd Lt. K. S. KULKARNY.

—————():o:()—————

An annual 'camp' of intensive training is the most important feature of a soldier's year of work, and the Bombay U. T. C. has had such a camp from the 16th to the 30th December 1928. The place selected this year was close to the village of Chinchwad, about 11 miles from Poona along the G. I. P. railway. This change from the last year's Santa Cruz near Bombay, was very much appreciated by all owing to the decidedly superior climate at Chinchwad.

The day to kick off arrived and the Agricultural College platoon-a batch of enthusiastic 35–marched off in the early hours of the 16th December to the Engineering College to join the rest of their 'B' Company which is composed of an equal number from the Deccan College and two platoons from the Sir Parshuram Bhau College.

Being situated only 11 miles from Chinchwad, the two Poona Companies—A and B—had been ordered to march up to the camp, while the Bombay and Dharwar contingents were to arrive by train. This did create a stir but orders are ORDERS. The two Companies left Poona about 7-30 in the morning and arrived into camp by about 11 a. m. The march to the camp was on the whole a jolly good one, but quite a new experience to the freshers.

Soon after arrival each man was given his camp kit which consisted of two blankets, a pillow case, three bed cases and a waterproof. The pillow and bed-cases were soon filled up with hay and made up into cosy 'lie-ons' to rest on during the nights.

This year, the parades ended at 12-30 in the noon instead of 3-30 in the afternoon as in previous years. This was a welcome change indeed as it was generally dull work after lunch at 1 p. m. The daily work started at 7 a. m. with physical training or bayonet fighting for half an hour. The object of these brisk exercises is to enable one to shake off the dullness after a night's good sleep and to prepare the body and mind for a day's good work.

The getting out of the tents at 6'45 a.m. especially for the first few very cold mornings was a hardship to some, but half an hour at P. T. soon made every one warm and fit. After breakfast and change of dress the regular parades began at 8'30. The time between nine and 12'30 was spent in various forms of intensive training in Company, Batallion and Ceremonial drills, 'defence,' 'attack' and 'protection' work, route marches &c. either on the parade ground or in the vast expanses of the undulating country to the north of the camp. The stress laid as regards extreme silence during these three hours and a half, the sharpness and clearness of movements, the implicit, ungrudging and unargued obedience to all orders with a spirit of comradary all for one and each for all, were in themselves a great education indeed. In any course of training specially where a large number of men are being taught the art of combining mass and individual application, the above are extremely vital to success. On the whole, looking to the comparatively short time during which we set ourselves to train young men, absolutely new to the proverbially stern military discipline, to become soldiers of a certain high standard, I might say, it is really creditable to every one concerned that the young lads try and pick up things so quickly. Indeed, with a little more heart and courage brightened with a little more ambition and an idea of taking pleasure in doing things well for which we volunteer, our young men ought to be able to show up yet far better.

Marching miles with comparatively heavy boots, an equipment laden body and a heavy rifle to boot, without being allowed to drink even a drop of water, is all new, but boys did it quite well, grumblingly at first but with an air of pride and conviction at the end. The quickness with which you suddenly drop flat on the howsoever stony and hard pricking ground when your 'leader' in an attack so orders, the swiftness with which you are up again and advancing when so commanded, are things which demand complete resignation of one's individuality for a common purpose. The lying in wait for the possible appearance of the enemy-oneself seeing yet unseen-with the ammunition pouches pressing into your body for hours, cultivates those fine qualities of patience and watchfulness. The men did grumble at this apparently unreasonable demand inspite of the actual absence of any enemy (it was to be taken for granted that enemy was there). All this grumbling and slackness would probably wane away as it actually does, they say, in some European armies who even during such courses of instruction, put in one or two live rounds in the general supply of blanks. Oh!

Then nobody complains of hard ground. They all prefer lying alive on howsoever bad a ground to lying buried even in a softer grave. But this entails a risk.

From 1 p. m. to close on the noon, one saw a very spectacular sight—all the men filing up one behind the other in two or three lines, with their dishes and bowls in their hands, to be served their 'lunch' or mid-day meal. It was very interesting to see each man all in his own hurry but compulsory patience, receives his *rice*, *chapatees*, the *amtie* (curry), his *bhaji* (vegetable), ghee, buttermilk and salt as he moved each time a step to his side and then walking off to find a cosy(?) place where to sit and satisfy the inner man. Scores of men, rich or poor at home but equally alike here, had a happy and light hearted chat with their 'pals.' The men from the north snarled at the over-pungent taste of the stuff while those from the south would not mind a little more chiilie in the curry. One joked at the other and so things went on merrily. The non-vegetarians had their own time also.

The vegetarian mess arrangements were on the whole acclaimed as extremely satisfactory by every one concerned. Between 2 and 4 p. m. was rest, except for those who were to provide a 'guard' for the next day or the 'Fire piquet.' The latter was an addition this year and was meant for any emergency. Things went on so nicely all the time that many wondered if a fire piquet would at all be useful. The doubt was allayed on the last night when, without any foreboding, all of a sudden, a part of the returned hay was seen to be on fire. The bugle sounded and almost the whole camp was out in a minute. The fire piquet ran with all the available tins of water. But on arrival it was found that the rest of the large amount of hay had carefully been separated by a few who posed to have run to the place earlier. The work done, all returned, each wondering as to the origin of the fire. Some thought it was purposely done by some one to see what a fire piquet would do in such a case. Others felt almost sure that some of the lighter hearted elements did this just for a little excitement on the last night.

Another new departure this year was compulsory games between 4 and 6 in the evenings. The mere 'compulsory' in the orders did not seem to be enough as a few 'lazies' were found to be hiding in their tents. Tent flies were ordered to be rolled up and thus sneaking under tents was made impossible. Games were various. We had hockey, football and basket-ball for the more hardy and rough tempered ones, volley ball and badminton for those with a milder

temperament and wrestling and boxing to suit the sterner but quieter elements. The games-ground was full of life and merriment and thus afforded a real good change from the more serene and stiffer atmosphere of the first half of the day. Regular boxing matches were also arranged in the evenings and the competitions and a few exhibition fights that came on were a good education in themselves. Bombay, with its natural advantages, led the way generally. In addition to the games which formed the principal part of the entertainments, we had on alternate nights, a goodly gramaphone releasing of English and Indian records of both vocal and instrumental music. All these contributed very largely to make the camp a happy home, in a sense, to remove the traditional scare of a fortnight of nothing but a hard and stiff time. It is understood that a cinema will be soon added and surely will not be unwelcome.

The river was close by for bathing. Drinking water was ample but for the over-chlorinalion.

27th December was the day for inspection by the Officer Commanding Poona (I) Brigade area. The night of the 25th was spent in variety entertainments mostly by the Bombay youngsters. On the 29th from two in the noon, the finals of all games were gone through. The trophies and prizes were then distributed by Mrs. MacGuinnes Smith. The camp then came to an end. The Poona companies again marched back on foot to Poona!!

On the whole this year's camp was a very different one from the previous ones. Thoroughly efficient and enjoyable, it has killed the camp ghost. This in itself ought to attract a larger number of our young men.

Our platoon stood the test well in the drill and turn out. But our performance was bad so far as games were concerned The cross country race is taken as the crux in the efficiency competitions and we were no where in it. Our men failed in this, thus washing themselves out of the chances. Same was the case in all other sports. It is wondered why it should be so. Do we not so often call our College the Sportiest in Poona? Have we not won many a trophy in the intercollegiate competition? Why then do our sportsmen shrink when the College calls on its young men for the U. T. C? Is not the U. T. C. which strives to train the nation's young in the art and profession of the country's defence, the right place for the able bodied sportsmen? Idle dreams and mere words will not help at all. Practical work—and well disciplined too—is what shall count in the end. Is it too much to expect the young to think on this? Shall we only talk? No, we hope not.

OUR SOCIAL GATHERING.

One of the happy events in the College-life of students is the Social Gathering and every body looks forward to it with the greatest expectation. This year's gathering which was postponed from the 1st term to the 2nd owing to some reason or other, was celebrated on the 14th of December. We had the honour of having Mr. T. F. Main, Director of Agriculture as the President at the function. There was a large gathering consisting of guests, old boys and well wishers and the whole function was as lively and successful as it could be.

The after-noon programme began exactly at 4 p. m. After the photo was over, the proceedings in the hall commenced with the Director in the chair.

The Principal welcomed the president and guests and addressed the audience as follows :—

Mr. Main, Ladies and Gentlemen, Colleagues and Students:

Every year it is the pleasant practice of the Poona Colleges to have a social gathering and this College is no exception. This year after one postponement, we are fortunately able to hold the ceremony, and I wish to bring to the notice of the president and visitors that this function is one which is organised and carried out by the students themselves, with a little consultation and help from the staff. I must congratulate the Hon. Gen. Secretary and the several other secretaries working along with him on their energy and taste in arranging to-day's gathering, the more especially as they have had so little time to do it, many of them coming from tour at the end of November.

This Gathering is a time when the staff, past and present students, people from the College and visitors from Poona and elsewhere meet to renew their friendship and to celebrate those ideals for which the College stands. I regret the absence through illness of Rao Bahadur Sahasrabuddhe and Dr. Uppal.

We are specially happy to-day in having to address us our Director of Agriculture. In this College, as one of the important

institutions in his control and as the source of many of his future staff, Mr. Main has an intense and helpful interest. I am sure too that he has not yet forgot his own college days and I am proud to think that he and I are graduates of the same University. Mr. Main has also, as you know, a very wide acquaintance with the agriculture of the whole of the Bombay Presidency and of Sind, and is therefore in every way specially qualified to preside at such a gathering as this. I shall no longer take up your time and will now ask Mr. Main to address us.

The General Secretary of the Gathering, Mr. Makhijani, then read his report and alluded to some of standing wants of the College and students, such as a proper Play-Ground, and electric installation in the hostel, which have remained unredressed and requested the president to render the necessary help in the matter.

After the distribution of prizes and trophies to the successful College sportsmen, the president delivered his address in which he gave some of his reflections on "Success in Agriculture". After going through the address—printed elsewhere in this number—every body will be convinced of the importance of practical hints or tips given by him to be followed in the practice of farming. He said that " Specialization is the road to fortune in Agriculture " was the slogan he wanted to place before the farmers in general.

Rao Bahadur P. C. Patil at the end proposed a vote of thanks to the president and the guests and after garlanding the president and the principal guests the proceedings terminated amidst cheers.

OUR AGRICULTURAL TOUR.

BY

S. MADHAV RAO, B. A.

Sr. B. Ag. Class.

Sight apposited with interest can retain tolerably exact copies of sensations and the following is an attempt to conjure up the sweet memories of a pleasant agricultural tour undergone by the final year students of our college in November last.

The month of September well nigh closing after the terminal examination, a grim smile of delight could be seen on the face of all lighting up their coarse features in the pleasing thought of going on a tour after their vacation; and on the 30th September when the Professor of Agriculture announced the programme detailing all the important places in Bombay Presidency including Sind, sweet reports were heard from our Sindhi friends at the prospect of a sea voyage to Karachi, visit to the Sukkur Barrage, the historic city of Mohanji Daro and other places like Sakrand rendered accessible by drive on camels. The distant objects immensely pleased us as we clothed them with the indistinct and airy colours of fancy, imagining all sorts of adventures and straining our hopes to descry new lands, rivers and mountains.

The touring party 50 in number left Poona on the morning of October 29 to Karjat under the guidance of Prof. Gokhale and his assistants Messrs. Kulkarni, Desai and Patel. On reaching Karjat the vast plains of paddy fields in different stages of growth recalled to our mind the series of class room lectures we had on rice, the different varieties adapted to varying conditions of soil and climate, its manurial doses, rabbing, single transplanting and the like. Mr. Bhalerao's lecture on the same enlightened us not a little particularly regarding certain selective strains and their wide-spread popularity. The availability of certain important ingredients like ammonium sulphate, bone-meal, green manure and others is a matter of no small interest. Ammonium sulphate alone in Karjat gives an additional yield of 20 %, while the same refuses to give any result whatsoever in the acid soils of laterite in Kumta.

The science of rabbing, the efficacy of bone-meal and the speculations on the aeration in rice fields brought on by the biological activities of a film of algae and bacteria on the decomposing green manure and the various methods of obtaining improved and pure strains brought home to our mind the extent and utility of the theoretical studies we have made thereon.

Rice is as conspicuous in this tract as cotton is by its absence, so that one could easily realize the importance of climatic factors in determining the agriculture of a place.

Bombay was our next halt. A days' stay here was rather too short to know what is all in Bombay. A visit to the markets and the cotton associations through the busy streets of Bombay with huge mills and companies on either side, showed in contrast to our quiet Poona the bustle and the free play of money in a commercial centre. The assistant secretary of the East India Cotton Association took us round the cotton market and fire-proof go-downs and explained to us as to how the different cottons are judged and valued, so also how disputes are settled.

We visited the Parel Laboratory where we were shown the detailed process of preparing and bottling different kinds of sera, and afterwards went to see the Veterinary College.

We then proceeded to the technological laboratory of the Indian Central Cotton Committee, where a batch of young men was seen carrying on researches in cotton. Their work in standardization of the various improved types of cotton grown in India is a good step forward in the adequate marketing of our home cotton. The young men working in the laboratory gave us a clear idea of the relation of the standard cotton to the commercial crop. The demonstrations regarding length, length-distribution, strength, rigidity, weight and width of a cotton fibre and the number of natural twists in it and the spinning tests widened our outlook of cotton as an economic crop not a little. Some eighteen of Indian cottons have been standardized and their merits determined.

In the evening we had a stroll in the city. As we threaded our way through short cuts the numerous huts of the mill-hands came to our view.

Surat was our next station. First we went to Utran. As we walked on to the fields in the morning we could see a graphic

picture of the numerous Gujarat mixtures. The system of intensive mixed cropping in beds of ginger, turmeric, gowar, chillies and yam under deep narrow wells seemed to be a speciality of the place.

We then had a different scene of dry farming of cotton and jowar. Isolation, development and introduction into general cultivation of certain improved strains of cotton and jowar seemed to be the sphere of work on the Surat farm. Experiments on cotton Boll-worm and Wilt of cotton and Smuts on jowar arranged with the extreme care on scientific basis revealed to us the immense possibilities of improvements in this direction; while the beautiful lecture on boll-worm and its significance in the Presidency and elsewhere by Mr. Deshpande, Entomologist, was an intellectual treat by itself. Some of us who used to attach little importance to the subject were reminded of the Goldsmith's village Parson—"Fools who came to scoff remained to pray."

The next scene was an expansive sheet of dry land over two thousand acres in Chharodi devoted to hay-making and cattle-grazing. A herd of 340 is maintained on this farm without any stall-feeding. From a heterogenous herd of Thar Parkar, Sindhi and all mixtures they have managed to evolve an almost pure Kankrej type. Till 1900, the farm was nothing short of an arid land; but now it has two important points to its credit-the evolution of almost a pure type and the service rendered to the public by giving premium bulls. One bull to a village would at least give 50 services which by a law of chance would mean 25 males and 25 females. Each male fetches Rs. 5 more in the market than one of local breed. This works out an annual out-turn of at least Rs. 125 per bull.

The prize winner in the recent Ahmedabad show was one Todar-a Chharodi bull of this farm, 5 years' old weighing 1666 lbs.

Our next halt was at Viramgaon. The adjacent Dholera tract of less retentive *basar* soils is mostly growing cotton of an inferior type. Due to presence of silt and alkalies the hard land does not lend itself to any improvement. A word on the sanitation of Viramgaon may not be out of place here. The public tank at Viramgaon was a horrible sight. It would be only a pardonable exaggeration to say that it was nothing short of a sewage tank. Water in it was extremely filthy and foul-smelling. A lot of men, women and children and even invalids were there, some bathing, some washing clothes and a few offering prayers after bath. Even the worst act of public nuisance was taking place;

while close by could be seen fruit-vendors and chiwadawalas carrying on their trade. It was an abominable sight vying with the filthy quarters of Bombay occupied by the mill-hands.

Now came the beautiful native states of Rajkot and Jamnagar in our programme to relieve us from the dull monotony of our short stay in Viramgaon. Rajkot has a peculiar system of tenure. The Thakur-Saheb is himself the loving landlord and his subjects the humble tenants. The revenue is levied in kind, subject to remissions and suspensions in lean years.

Jamnagar is a beautiful symmetrically built city, well worth the name Navanagar. The Jamsaheb, ruler of the State, seems to be a passionate lover of art. The State is making rapid strides in orchard-growing and landscape gardening. The flower-gardens there have been fashioned with taste and decorum under the personal supervision of Mr. Mandke, B. Ag., F. R. H. S.—an old student of our College. The treatment we received at the hands of the officer in charge of the guest-house was excellent and we owe to the Jamsaheb a great debt of gratitude.

We then proceeded to Dwarka the holy residence of Lord Krishna. Far from a distance of about 15 miles the conical tops of the temple projecting high up to the skies could be seen against the red rays of the setting sun. On alighting at the station we took no time in filling our luggage in the small Lilliputian bullock-carts resting on small wheels of hardly a foot radius, with a small donkey-like bullock standing in front of each cart. In fifteen minutes we found ourselves in the temple enveloped in an atmosphere of spirituality.

By now a third of our programme well nigh over, the prospect of a sea-voyage to Karachi was drawing near. On the morning of November 6th at 9 a. m. arrived the steamer S. S. Vita from Bombay and we were on board the steamer carried by a machawa. It was a very calm voyage indeed and everybody enjoyed it.

Next morning we reached Karachi. Though situated in a pastoral land, it is a beautiful city with its well-laid out broad streets and roads bounded on both sides by huge, massive and many storeyed buildings. It so prepossessed itself that we felt a presentiment of what the Sind tour would be like, but realisation often falls short of expectation !

We visited the Mahatma Gandhi garden and the Sewage farm. None of them enlightened us much. The object of the farm is to grow fodder crops and supply them to the municipality in return for the sewage and labour supplied free. Every fodder crop is grown there on a let-alone policy, no preferential treatment being given to any. Vegetables are not grown there as they are objectionable to the sentiment of the people.

We then visited Malir Cattle Farm which maintains pure Sind and Thar-parkar breeds of high quality. The performance of Matari who calved when she was only 34 months old and gave 5647 lbs of milk in 375 days and still continues without drying is certainly excellent. In the Deccan the Sindhi animals go down after the 3rd calving. For want of nearness of the market milk here sells at 18 lbs per rupee.

Our next place of halt was Nawabshah—a dry dusty place with practically no vegetation. From here we proceeded on camel-back to Sakrand to visit the Agricultural Research station where Mr. Tamhane—the senior officer of the station-and other staff gave us an idea of the agricultural conditions under which it is proposed to develop the land commanded by the Sukkar Barrage in Central Sind in adverse conditions of Kalar land and drainage.

We then left for Sukkur where we visited the Government farm the object of which has been changing from time to time. Till 1918 Kalar reclamation by scraping and silting was the work. The land was then grown with rice and fallowed. Rabi berseem thrives well in these alkaline lands reducing Kalar. Since 1918 and after, the object of the farm has been to produce a buffalo herd of *Murra* type in which they have succeeded to an appreciable degree. Wheat is the staple crop and Jambo is an important oil seed. Cotton seems to have no liking to that place. It puts on its normal growth of foliage but fails to put forth bolls.

In the after-noon we had a plunge in the Indus which was most refreshing after an irksome walk of 12 long and weary miles in the sun along dusty roads. The same evening we were to visit the Sukkur Barrage but as the Simon Commission had arrived that time we experienced a great deal of trouble in getting the necessary permit to visit it.

The Sukkur Barrage is one of most important works ever projected in India. The Barrage-work proper and the excavation of the canals and branches are in full swing. The total quantity

of earth work in the project is estimated to be 5000 million cubic feet. The sight of a host of gigantic dredgers plying across the Barrage-area by themselves gave us an idea of the stupendous magnitude of the work.

As we proceeded along the left bank of the Indus we found the population steadily increasing with a corresponding decrease in the size of holdings. The average holding in Karachi is of 40 acres, 47 in Nawabshah and 15 in Sukkur. In Karachi the bulk of the holdings lies between 20 to 25 acres. In Nawabshah out of 26000 holdings only 6000 holdings are below 5 acres.

Thence we proceeded to Jacobabad, the northernmost part of Sind verging on the borders of British Baluchistan. This place is known for extremes of climate being the hottest and the coldest and the contrast between our mild Poona climate and that in Jacobabad was striking. Pusa 4 commands the irrigated area and Pusa 12 the Bosi area to avoid frost at the time of flowering. Pusa 12 being an early variety ripens, by about the middle of November even if it is sown 20 days later than Pusa 4.

We visited here the estate of Khan Bahadur Dilmuradkhan, son of Khan Bahadur Bahadur Khan of 101 years of age. This centenarian living happily in the midst of sons, grandsons and grand-daughters, has divided his estate among his four sons. The share of the eldest alluded to above, comes to 40000 acres. Before division, the old man was paying a revenue to the extent of 1 Lakh. The cultivation is done through *Haris* on a share system. A man with a pair of bullocks constitutes a *Hari*. To each *Hari* he gives out 20 acres and an advance of Rs.500 and all the permanent improvements of land—such as embankments, reclamation of kalar, &c. are done by the owner. From each *Hari* he gets annually from 800 to 900 Rs. Half of the land is fallowed and half is cultivated in turn. Any land which is not cultivated for 3 years comes under fallow-assessment. All *Haris* are reported to be contented and happy. This tract seems to be favourable for the breeding of cattle which are in great demand from Jodhpur, Panjab and other adjacent places. The visit to the estates of Khan Bahadur terminated with a sumptuous treat to the party from him, followed by a vote of thanks from the party to him in return.

From here we went to Larkana along the right bank of the Indus. This tract can be said to be the Konkan of Sind with a rainfall of five inches supplemented by water from inundation canals. Rice suits this tract well and the object of the farm is mainly rice-

breeding, including cultural, varietal and manural experiments. The high yielding early *Kangani* and the sweet scented late *sugdasi* are the local strains. Better strains from these have been obtained. Hot-weather ploughing gives better results than puddling. So Larkana agrees with Karjat in rabbing and with South Kanara in hot-weather ploughing; it also agrees with the Konkan in refusing to respond to any manurial treatment.

The zamindar of North Sind particularly does not seem to much care for the systematic cultivation of land and much less for agricultural improvements. The tenant can not bring about any improvement unless he is monetarily helped by the zamindar.

Hyderabad was our next place of halt. Mr. Jagatiani, B. Ag. took us round his farm extending over 150 acres. He gave us his experience about private farming. He lost in the beginning in his orchard farm and took this farm from a pleader who had invested a lot of money in initial improvements. He (Mr. Jagtiani) was irrigating 150 acres by a 10″ pump. He was expecting a good outturn. The moral of his talk was that to be a successful agriculturist one must be a farmer, a manager and a bussiness man. After a hearty vote of thanks to the host for the kind treatment and treat received at his hands we wended our way back.

Our Sind tour came to an end with a visit to Mirpurkhas. Here we visited the Govt. Farm. The chief peculiarity of this tract is that the cultivator has always to be watchful about the "Vapsa" condition of the soil, or else on evaporation, the surface sets hard and bad germination is the result.

From Mirpurkhas to Ahmadabad was a sudden but welcome change, The sweet presentiment of a prospective Sind tour which developed while getting on board the "*Vita*" came to an airy nothing except for the educative value of it. How true it is when Shakespeare says "Thought of joy is more enjoyed than joy enjoyed." On our way we visited Mohanji Daro and Mount Abu.

Our visit to Ahmedabad gave us an opportunity of visiting the second Presidency-Agricultural show. It was exactly on the lines of the Poona show.

Baroda was our next place of halt. Mr. Sane-the Director of Agriculture and an old boy of our College, took us round the farm and enlightened us on the method of farming in North Gujarat.

The rest of the time was utilised in sight-seeing and visiting places like the museum, Jewellery palace, and other palaces of the Maharaja. In the evening we were given a tea party by Messrs Govande Bros, followed by a musical concert.

By now we felt like having completed our tour; but no! the cotton varieties of *Neglectum* and the Dhulia strains from *Bani* and *Comilla* were awaiting us in Jalgaon with the kindest attention. They had their own stories to tell. Mr. Prayag, the champion of N.R. first introduced us to all the members in the *Neglectum* gallery, and then the Dhulia strains with their ancestral traditions and finally closed the parley with due deference to both.

We paid a visit to Ajantha caves which are situated in a beautiful glade south of Jalgaon. The natural scenery there is superb with hill streams meandering down a precipitous rock 250 feet high. There are 25 caves. No carvings in India exhibit such an admirable combination of an exquisite type of architecture, sculpture and painting as these. On the way at Utran we visited the large Citrus cultivation of Mr. Manikchand.

Our last place of halt was Belapur where we visited the sugar factory of the Belapur syndicate. We had here the opportunity of seeing the records of a Cooperative Bank, which clearly evinced the bad economic condition of the people in that tract. This set us to think as to what agricultural improvement was possible unless the economic condition of the farmer was improved. We came to the conclusion that the satifactory progress of Indian Agriculture does not require so much of research and experimentation on Rothamstead lines, as close examination of the farmer and the actual rural conditions by Agricultural Economists.

The finishing stroke of such a grand tour must indeed be a grand one, well worth the name. It was in the form of a sumptuous treat arranged by Prof. and Mrs. Gokhale at Belapur at his brother's residence, which eclipsed all those received throughout the tour. Prof. Gokhale's closing speech after dinner can better be imagined than described; while our token of respect and love to him needs no bush.

The same night we left Belapur to reach Poona on the morning of November 25.

Thus ended the happy tour. I cannot however close the account without making a mention of the kind treatment and guidance received at the hands of our leaders. and expressing a feeling of heart-felt thankfulnes for the same on behalf of myself and the party.

COLLEGE NEWS AND NOTES.

The College is in full swing at present. The students in the hostel are seen burning midnight-oil on their notes and studies and busy preparing for the 2nd terminal examination to be over by the beginning of this month and the final examination to be held in March next. We wish them all success in their efforts.

It has been notified that Prof. B. S. Patel who was transferred to Gujarat as the Joint Deputy Director for the period of the show has now been appointed as Deputy Director of Agriculture, Gujarat, in place of Rao Saheb Bhimbhai Desai retiring. Prof. Gokhale continues and is confirmed as Professor of Agriculture.

We congratulate-though late-Mr. Ali Mahamad Ulvi on his appointment as assistant Professor of Dairying and Manager Agricultural College Dairy in place of Prof. Baluch, who has been deputed to work as Secretary to the Cattle-Improvement Committee in Sind.

We record with thanks the donation of Rs. 30000 by Bai Sakarbai Nasarwanji Anklesaria, Main street, Poona for renovating the College Veterinary Hospital.

On examination of several cases brought to our veterinary hospital we regret to note that the cases of barbed wire-fence-wounds are increasing in number. It is a high time that the S. P. C. A. people make some move in this matter.

Our Gymkhana :—Our congratulations to Mr. D. G. Desai and our Foot-ball team who stand runners-up in the recent P. Y. C. Tennis tournament and in the Inter-Collegiate Foot-ball matches respectively.

The elections for the new office-bearers of the Managing Committee for the academic year 1929–30 will be held in this month. The abuse of voting power is nothing short of a callous breach of one of the most sacred duties of responsible and freedom-loving citizens. It is the duty of one and all to exercise the right of voting and to give their votes freely to the ablest and fittest persons without being worshippers of personal predilections and prejudices.

Our Debating Society :—We had a series of interesting lectures held in this quarter and specially make a mention of the following. Prof. Gokhale gave us a lecture on " Dairying Industry in India. " Dwelling at length on the food-value of milk and its products for human health he passed on to the industrial aspects of it. Dairy industry, he said, acts as a balancing wheel on agriculture. Many products which cannot be consumed as such by man are converted

into human food when fed to cattle. The animals help us in maintaining the fertility of the soil, and carrying on agriculture. Owing to the scarcity of milk-supply, now-a-days milk is considered as a luxury whereas it ought to be a food of all rich and poor.

Mr. Bruen, the president remarked that we are short of milk because of the influx of population into towns and of the stagnant condition of milk in the country. The deterioration of cattle is due to the curse of free-grazing. Dairying and Cattle breeding are no doubt in a bad condition, but time will make amends in future when we know how to make better use of milk.

Mr. Bhalerao, Crop Botanist, lectured on the subject " Re-birth versus Heridity. " He said that the subject had partly scientific and partly moral and philosophical significance. He explained in brief the two theories, their impliction and remarked that the theory of re-birth was out of date and required being replaced by the theory of heredity. The Re-birth theory has been based on the law of compensation or *Karma* and *Dualism* implying the two entities—God and the Universe, while the theory of heredity is based on Chromosomes which directly connect the succeeding generations and satisfies all doubts

R. B. D. L. Sahasrabuddhe, the president gave his decision on the two schools of thought and said that he was in complete agreement with the lecturer. The theory of re-birth can not be explained satisfactorily, while the theory of heredity is perfectly tenable from all points of view. As we have been able to breed improved types of plants and animals by combining desired characters, so we shall be successful in evolving an improved type of man by paying attention to science of Eugenics.

The third interesting lecture was delivered by Prof. V. G. Kale on " Technique and Economics of Agriculture, " Dr. Burns presiding on this occasion. Suitability of a thing for a certain purpose is called the technique and the question of judging the same on the basis of profit and loss is the economics of it. A plough may be technically good, but if it is not within the purchasing power of ordinary cultivators, it is economically unsound, He illustrated this theory by quoting various examples. He said that researches in Agriculture must be conducted, but they would be acceptable by the cultivators if they stood the test of economics. Formerly Agriculture in India was the premier industry, but now it has become a bye-industry. To make it a remunerative and paying industry is a great problem and it can not and will not be solved unless it is tackled economically and even socially. The president remarked that he agreed with what the lecturer said and by way of illustration he gave some

instances of how improvements, scientifically good had to be abandoned as they economically proved to be unpaying. The cultivators readily accept pure seed and improved varieties because these things are acceptable without the least disturbance to the routine operations.

Our Gathering :—It was held on the 14th of December. How successfully it was celebrated, can be known from the detailed account published else where. Our thanks are due to all those who took part in making the function a success. We give down below the statement of accounts in connection with the same :—

General statement of accounts of the Annual College Social Gathering for the Year 1928.

Receipts.	R. a. p.	Expenditure.	R. a. p.
Donation from the College staff and Outsiders	390–0–0	General Secretary	103–11–0
Students' subscription	446–0–0	Refreshments	350–14–0
Gymkhana Donation	50–0–0	Sports	269–12–6
Entry-fees from Sports	250–0–0	Stage	134—0–0
Student's Guest-tickets	11–0–0	Reception	54—8–0
Last year's balance	1–4–0	Decoration	10–0–0
			922–13–6
Total...	923–4–0	Balance...	0—6–6
		Total...	923—4–0

Poona
25-1-1929,

W. BURNS,
President, Social Gathering Committee.

D. K. MAKHIJANI,
General Secretary for Social Gathering.

THE POONA AGRICULTURAL COLLEGE MAGAZINN.

VOLUME XX.

INDEX TO ARTICLES.

A

B

C

D

E

INDEX TO WRITERS.

———():o:()———

Department of Agriculture, Bombay.

LEAFLET No. 6 OF 1928.

(Replaces Leaflet No. 6 of 1927)

CONTROL OF THE POWDERY MILDEW OF GRAPE.

Powdery mildew, locally known as *bhuri*, has long been recognised as the most destructive and widespread disease of grape vine in the Bombay Presidency. It causes considerable damage every year to vines not properly treated, resulting in a heavy reduction in yield. In consequence, as a result of certain experiments carried out in this Presidency, the Bombay Department of Agriculture issued Leaflet No. 3 of 1912, recommending the practice of spraying the vines with Bordeaux mixture at certain intervals of time.

Though this method has checked the mildew, a more satisfactory treatment has now been discovered, by dusting the vines with sulphur.

Dusting with sulphur is generally recognised as a specific remedy for all powdery mildews, including the one of grape. Experiments made in the year 1926-27-28 in the Deccan have now conclusively shown that the application of sulphur on mildewed vines is much superior to that of Bordeaux mixture in effecting the control of the disease, in improving the quality of fruit, and in cheapness. In almost all cases, 100 per cent. control of the disease was secured by dusting.

Symptoms.—This disease is too well-known to grape growers to require a detailed description. However, it may be stated that it may attack any above-ground part of the vine,—leaves, shoots, blossoms and fruits.

On leaves.—It appears at first as whitish patches, which ultimately turn grayish white.

On shoots.—The fungus also attacks the young shoots or canes. Usually it is confined to patches; but in cases of severe attack, the whole surface may be involved.

On blossoms.—Affected blossoms fail to set their fruit.

On fruits.—If young berries are affected, they may drop off. If attacked when half grown, the berries become irregular in form. If severely attacked, they may crack, thus reducing their value for market purposes. Slightly affected berries may ripen without cracking, but they are disfigured by spots.

Remedy.—The best remedy for this disease is the application of pure finely powdered sulphur. The value of sulphur as a preventive of grape vine mildew is determined chiefly by its fineness. Given the proper conditions, the finer the particles, the greater is the rapidity with which the effect takes place.

Kinds of sulphur.—Sulphur in powder is obtainable in three forms, namely ground sulphur, sublimed sulphur or flowers of sulphur, and precipitated sulphur or milk of sulphur. Concerning the respective merits of the three forms of sulphur, there does not seem to be any appreciable difference in efficacy, provided the particles are of equal fineness.

Where to get sulphur.—Through the enterprize of the Trade, sulphur powder of the order which passes through a sieve having 200 meshes per square inch, is now available in India. The Trade can supply this grade of sulphur, in any quantity, at Rs. 190 per ton retail, and Rs. 185 per ton wholesale.

How to apply sulphur.—The best method of applying sulphur is by means of an efficient duster. There is a variety of hand dusters available on the market, which are either of the bellows type or of the fan blower or crank type. The crank type of hand dusters are now the most commonly used and the most efficient, and very much superior to the bellows type of dusters. Three well-known dusters of the crank type – Peerless Dust Gun, Savage Duster and Niagara Blower Dust Gun—were used in these experiments. *It has been found that the Peerless Dust Gun is decidedly a better machine than the other two, as it is more convenient to handle, takes less time and effort to dust one acre of grapes, and gives a much better distribution of the dust.* It does not require much experience to know that a dusting machine, which has a very smooth working and gives a good distribution of the dust, has a great deal to recommend it; and it can confidently be stated that the Peerless Dust Gun has very few "peers" in these respects.

The Peerless Dust Guns are geared very high so that slow cranking will give the desired distribution of sulphur. One

turn of the handle revolves the fan forty-three times and with ordinary operation the feed will be in the neighbourhood of 2,000 revolutions per minute. The parts are interchangeable. The net weight of the duster is 13 pounds and the capacity of the hopper is 15 pounds of sulphur which will pass through a 200-mesh sieve. These dusters, which are manufactured by the Peerless Dust Gun Company, 1600 East Twenty-fourth Street, Cleveland, Ohio, U. S. A., can be obtained from Messrs. Dharamsi Morarji Chemical Company, Ambernath, who are the sole importers of these machines in India.

When to apply sulphur.—The number of times it is necessary to apply sulphur will depend mainly on three factors: season, locality and sources of infection.

In the Deccan, the following schedule of sulphuring is recommended:—

(1) The first application should be given at the time when the new shoots are not more than six to eight inches long. The first sulphuring is by far the most important and should be done *very thoroughly*. The aim of this application is to prevent infection of the young tender shoots and leaves which, at this stage, are very frequently attacked.

(2) The second application should be given when the blossoms begin to open or just before blossoming.

(3) The third sulphuring should be done about one and a half months after the second application. This time the vines should be somewhat lightly dusted and the quantity of sulphur applied should not be more than that used in the second application.

(4) If the first and second applications have been thoroughly given and if there is no danger of reinfection from untreated vines, *the fourth application will not be necessary*. However, if there is a need for it, it may be given about one month after the third application, but the quantity of the dust applied should not be more than half of that used in the latter case.

(5) Another application of sulphur should be given at the time when the new shoots after the April pruning are about a foot or so long. The quantity of the dust applied should be about the same as that used in the first sulphuring after the October pruning, as per item (1) given above.

It should be borne in mind that after any application it will be necessary to resulphur if three to four days of bright sunshine have not intervened before the dust was removed by rain. It should also be repeated that the aim of sulphuring should be to cover every exposed surface of the vine. *No vine, on any account, should be left untreated in a vineyard.*

Time of the day to apply sulphur.—Sulphur may be applied at any time of the day, provided there is not much wind nor excessive moisture in the air.

Dry, moderately warm weather and still days are the best.

Cost of sulphuring.—The *maximum* cost of four sulphurings for one acre of grape (about 750 vines) including labour is as follows :—

Applications.	Sulphur in pounds.	Days per man.
From October to March—		
First	20	½
Second	30	1
Third	30	1
From April to May—		
First	20	½
Total ...	100	3

	Rs.	a.	p.
100 pounds of sulphur at Rs. 190 per ton	8	7	9
3 Man-days at annas 10 per day	1	14	0
Total ...	10	5	9

It will be seen from the above statement that the cost of the four sulphurings for one acre of grapes comes to about Rs. 10; whereas three applications of Bordeaux mixture alone (from October to March) cost from Rs. 50 to Rs. 75, Rs. 65 being a fairly good average. Besides the advantage of less cost, sulphur dusting is a very rapid method of treating the vines and makes an average grower independent of hired labour. For instance, for three applications of Bordeaux mixture, the time required by *one person* to treat one acre (including the time for preparing the mixture) is *38 days* (two men working take 5 days for the first application, 8 days for the second and 6 days for the

third) ; whereas for the same area one hardly requires *3 days* for all the sulphurings.

It may also be noted that 100 pounds of sulphur for all the applications was the maximum quantity of the dust used, and that it was found to control the disease *under all conditions.* However, considerable saving in the quantity of dust used, can be effected provided the applications are given at proper time.

Sulphur and Bordeaux mixture treatments compared.

Sulphur treatment.	Bordeaux mixture treatment.
(1) If properly applied, it gives 100 per cent. control of the disease.	(1) It has not been able to effect a complete control under any conditions.
(2) Cheaper than Bordeaux mixture treatment.	(2) Costs more than sulphur treatment.
(3) Causes no scorching on the leaves.	(3) Under certain conditions Bordeaux mixture causes severe burning of the leaves.
(4) Improves the quality of fruit.	(4) No such advantage can be claimed for Bordeaux mixture. On the other hand, the berries are stained by this treatment.
(5) Requires no preparation.	(5) The preparation of Bordeaux mixture is a rather tedious, messy business.
(6) Requires no water.	(6) Requires water and big barrels for preparation.
(7) Sulphur can be stored indefinitely.	(7) Cannot be stored indefinitely.
(8) Sulphur can be applied in a short time during critical periods and uncertain weather conditions.	(8) It is not the case with Bordeaux mixture treatment.
(9) It is much easier to apply and is a labour-saving treatment.	(9) Not so here.
(10) Requires a dusting machine which gives little trouble.	(10) Requires a spray pump which is apt to give trouble.

Q 41—2

BOMBAY : PRINTED AT THE GOVERNMENT CENTRAL PRESS.

Department of Agriculture, Bombay.

LEAFLET No. 7 OF 1928.

(Replaces Leaflet No. 1 of 1910)

CONTROL OF THE RED ROT OF SUGARCANE.

Red rot of sugarcane, locally known as "*Us rangne*" (उस रंगणे), is undoubtedly the most destructive and wide-spread disease of the sugarcane in the Bombay Presidency. In fact, there is not a cane-growing district where this disease does not exist, although it may be much more destructive in some places than in others. Since sugarcane is an important field crop in the Presidency, and is subject to considerable damage by this disease, it seemed desirable that the most pertinent information regarding the disease and its control should be made available to the cultivators. With this end in view, this leaflet is issued.

Cause.—The cause of red rot is a fungus parasite which lives in the cane and sucks out food by means of long, white threads. These threads are not visible to the naked eye.

Symptoms.—Normally it is difficult to recognise the disease in the field, as it produces no external symptoms. However, in cases of severe attacks, the first external symptom is the drooping followed by yellowing of the upper leaves of a nearly fully grown cane. The leaves first affected are the third and the fourth from the top. The tip of the leaf first withers and the withering extends down the margins, leaving the centre green. Ultimately the entire crown wilts, resulting slowly in the death of the whole stool. Since similar symptoms may be caused as a result of drought, the diagnosis of the disease by external symptoms becomes very difficult. However, the disease can best be recognised by splitting open a cane, which, in the early stages of the disease, gives out a sour smell and shows reddening of the tissue near the base. But reddening of the pith may be caused by any one of many other causes; so a positive proof of the disease is the formation of white areas

with red margins. Ultimately the pith or the inside of the cane shrinks, resulting in the formation of cavities, which are covered by a cobweb-like growth of the fungus.

Conditions favouring the development of the disease.

Defective soil conditions play a very important part in causing cane to be very severely attacked by red rot. Excessive flooding in water-logged or poorly-drained soils affects the spread of the disease to such an extent as totally to wreck a crop. Canes planted in such soils are much more susceptible to red rot.

The attack of insects, especially leaf hoppers, tends to increase the susceptibility of the cane by weakening its vitality.

Withering clumps, left in the field after harvest, add to the sources of infection.

Control measures.

(1) Great care should be taken to use none but healthy setts for planting out. These setts can be obtained by cutting the cane and examining the cut ends of the setts for any sign of reddening. The setts showing any red discolouration at the cut ends should be rejected *without hesitation.* If this operation is well done, the disease in a field can always be kept down to the minimum.

The practice of planting out whole canes should be discouraged, as there is no way of telling whether the disease is present or not.

When the local "seed" is badly diseased, healthy setts should be imported from another locality.

(2) Excessive flooding of fields should be avoided, as it tends to give water-logged conditions in poorly-drained soils. Care should therefore be taken not to give more water than is necessary. If the field does not have good drainage, it must be provided by means of deep ditches in the field and at the edges of the field.

(3) It has been found that the fungus does not persist in the soil for more than three months or so. Diseased lands should be thoroughly ploughed up and exposed to the sun. This results in the death of the fungus in a short time. Under these conditions, a long rotation may not really be necessary.

(4) After harvest, withering clumps and cane débris should be removed from the field as early as possible. In a field in which a diseased crop has stood, ratooning should *never* be practised. In no case, however, should a diseased crop be ratooned. On the other hand, it should be pulled up and burnt at the earliest opportunity.

(5) The use of such varieties of heavy-yielding canes as are more resistant to the disease than others is also recommended.

BOMBAY: PRINTED AT THE GOVERNMENT CENTRAL PRESS.

Gratis [FIRST EDITION]

Department of Agriculture, Bombay.

LEAFLET No. 8 OF 1928.

(Replaces Leaflet No. 4 of 1911)

RATIONS FOR CATTLE WHEN FODDER IS SCARCE.

Drought affects cattle more severely than men, and once an animal gets run down in condition, it is not only difficult to bring it back to normal, but as it is a long business, it is naturally very expensive.

The bad effects of starvation may ruin an animal for life. It will be seen that it is far cheaper in the long run to keep cattle fit throughout the year than to restore them to fitness after privation. If cattle keepers and farmers would only realize this, they should, and could make provision for the future. In the Bombay Presidency in a good year fodder in the shape of kadbi and grass-hay is so plentiful and cheap, that all those who have the care of livestock in any shape or form can, if they so desire, make provision against a bad year. Fodder can be stored as dry fodder in the shape of kadbi or hay, and in the green form as silage. Silage is merely green fodder preserved in pits or towers. Further detailed information as to how silage can be made will be supplied by the Department on request.

It frequently happens that the people who are fortunate enough to reside in areas not often affected by famine, suffer most, as they are apt to neglect to make provision for the future, and thus their cattle suffer severely in a bad year as they are usually of the large type and accustomed to be well cared for so that they cannot stand privations so well as animals bred and reared in areas of frequent scarcity.

When a cattle owner is faced with a shortage of fodder, the bulky food essential to cattle—the following advice may prove useful to him. The first point to realize is that bulky fodder, such as kadbi and hay, is absolutely essential to the health of an animal, and therefore whatever substitute is given in the place of fodder, must be bulky.

I. Green fodder can, does and will replace dry fodder, provided, it is fed at double the rate of dry fodder; it should however be sun-dried. Cut to-day and spread out to dry what you intend feeding tomorrow. Newly cut green fodder if fed to hungry cattle is likely to cause Tympanitis, that is, gases in the stomach and intestines that may prove fatal. Many hundreds of poor weak cattle die due to this in the early monsoon.

II. Never feed immature green jowari or stunted jowari, that has not flowered. This may poison your cattle as it contains a poison deadly to cattle.

Q 50

III. Green maize may be fed at any stage of its growth.

IV. Lucerne is an excellent fodder, and can be fed with advantage up to 10 or 12 lbs. per animal per day.

V. The husks of cotton seed, gram or any pulse makes a good bulky ration. These materials are easy to store and will not deteriorate if kept in a dry place.

VI. The following food-stuffs are all useful foods for cattle :—

Guvar, math kulthi, tur chuni, gram chuni, phol, udid, oil-cakes, cotton-seed, wheat bran, rice bran, bajri and jowari seeds.

VII. Shevri makes a good green fodder relished by cattle ; it grows quickly and yields heavily. Those living along rivers should take advantage of their opportunity and grow Shevri ; it is not only useful in famine but at any time makes a good cheap fodder. It is a perennial and yields many crops of good fodder.

A good ration for a large bullock when fodder is scarce and expensive would be 10 to 15 lbs. of hay or kadbi with 2 lbs. of either cotton-seed husks, or gram husks or phol as the bulky ration ; to this should be added either 3 lbs. of any of the pulses or 2 lbs. of oil-cake or cotton-seed with 4 ozs. of salt. Bran is a good food and may substitute any of the concentrates. If green fodder is available, it should be fed at twice the rate of the dry fodder.

To feed cattle properly it is necessary to watch them ; should they be going down in condition, an additional pound of the concentrate should be given ; and it should be remembered that one animal may thrive where another starves.

BOMBAY : PRINTED AT THE GOVERNMENT CENTRAL PRESS.

Gratis [FIRST EDITION]

Department of Agriculture, Bombay.

LEAFLET No. 9 OF 1928.

(Replaces Leaflet No. 3 of 1921)

HAY, ITS MAKING, AND THE USE OF THE MOWING MACHINE.

Hay to be useful as a fodder must be made at the right time, and the right time to make hay is just before the grasses flower, for as soon as the grasses start flowering, all the nutriment in the plant goes to form seed.

Dry grass cut after the seed has formed and possibly fallen, has little value as a food and the animals eating such stuff gain little benefit; such coarse fodder is injurious as it disturbs the digestion and often injures an animal's mouth.

To make good hay, it should be cut just before flowering, and by commencing early, a large area can be cut before the seed has formed. When cut, it should be allowed to remain on the ground for a couple of days, then put into small stacks, in which form it is air dried and then after a fortnight carted and stacked. Such hay will provide excellent fodder for animals, and thus expenditure on concentrates can be saved.

In this Presidency it is difficult to make good hay, as labour is expensive in the hay season owing to the work of harvesting other crops such as Rice, Bajri and Jowari, and also about the same time there is the sowing of Rabi crops. It has been found that this difficulty of labour can now be overcome to a large extent by using the grass mower. These machines can be used to advantage on all flat lands, free of shrubs and stones. Thousands of acres of suitable grass areas are to be found all over the Presidency. The saving on labour and the quality of hay made by using the mower justify expenditure on levelling and clearing land to make it suitable for the mowing machine.

To-day there are many makes of mower all of which are of modern design and adopted to suit the Indian bullock. When ordering a Mower it should be remembered to mention that bullock-power will be employed as the gears are different from those required for a horse or tractor hauled machine.

There are certain accessories and wearing parts of the Mower, and it is essential to keep these in stock.

These include—

(1) A knife grinder to grind and keep knives sharp.

(2) One spare knife complete.

(3) A few middle sections of the knife.

(4) A few rivets to attach knife sections to knife.

All makes now available are adequately provided with spare parts.

The type of machine recommended is the "vertical lift."

If it is desired still further to reduce the cost of harvesting hay, a hay rake is recommended; this gathers the hay up into heaps and facilitates loading into carts.

A mowing machine drawn by a fair pair of bullocks cuts about one acre of grass in two hours. In North Gujerat a mowing machine fitted with a rake, has rendered it possible to cut, rake, make into heaps and then cart and stack 1,000 lbs. of hay for Rs. 2. This work has been carried out on a scale of over 1,000 acres of land for several successive years, and the figure can be relied on.

Under the same conditions cutting by hand, bundling and carting has cost Rs. 6 per 1,000 lbs. The benefits of using the mowing machine may be summarized as follows :—

(*a*) Reduced expenditure;

(*b*) Superior quality of hay;

(*c*) Additional time for grazing after harvest, amounting to some two months.

BOMBAY: PRINTED AT THE GOVERNMENT CENTRAL PRESS.

Department of Agriculture, Bombay.

LEAFLET No. 10 OF 1928.

THE USE OF POUDRETTE AND TOWN-SWEEPINGS AS MANURES TO DRY CROPS OF JOWAR AND COTTON IN THE TRANSITION TRACT OF THE KARNATAK.

In the transition tract of the Karnatak consisting of black soil, kharif jowar and cotton are grown extensively in a two year rotation. In this tract the rainfall ranges from 25 to 30 inches and is fairly well-distributed between July and October. Occasionally heavy showers fall from April to June. These facilitate the preliminary operations of the fields. Some rain falls in November and it helps the crops to make further growth. Both the crops of jowar and cotton grow well and give much higher yields than in the eastern tract which also consists of black soil but receives less rain.

It is, therefore, essential in the transition tract to manure the land in order to keep up its fertility. The cultivators in this tract are aware of this and they utilize as much Farm yard manure as is available and apply it to the jowar crop at rates varying from half ton to 5 tons (1 to 10 cart-loads) per acre. The jowar crop responds well to the manure and the succeeding cotton crop is also well benefited. It has been found on the Dharwar Farm that even a heavy dressing of Farm yard manure to the extent of 10 tons (20 cart-loads) per acre can be profitably and economically applied. But the production of Farm yard manure is limited and it is not available for application in large doses in extensive areas.

It was, therefore, thought desirable to find out substitutes for Farm yard manure. Experiments with artificial manures on cotton are in progress on the Dharwar Farm and some of them are producing encouraging results. Experiments with manures of bulky nature, such as Poudrette and Town-sweepings, were conducted on the Dharwar Farm for 14 years. The results of the experiment have conclusively

proved that these manures can be very profitably utilized in the cultivation of jowar and cotton in the transition tract of the Karnatak.

These manures were compared with Farm yard manure. They were all applied at the rate of 5 tons (10 cart-loads) per acre to the jowar crop grown in a two year rotation with cotton. The cotton crop was not manured. Plots to which no manure was applied either for jowar or cotton were also included in the experiment. The following table shows the averages of fourteen years yields of jowar and cotton and the net profits per acre per rotation obtained from the various treatments.

Average results of fourteen years per acre.

Kind and quantity of manure	Yield of jowar grain	Yield of jowar fodder	Yield of seed cotton	Net profit per rotation
	Lbs.	Lbs.	Lbs.	Rs.
*Poudrette—5 tons** ...	1,087	3,580	501	50
Town-sweepings—5 tons ...	918	2,890	477	46
Farm yard manure—5 tons ...	975	2,798	496	45
No manure ...	688	1,934	448	36

These figures clearly show that—

(1) Poudrette was the best and produced the highest yields and net profits.

(2) Town-sweepings produced slightly less yield of jowar grain and seed cotton and slightly higher yield of jowar fodder than Farm yard manure.

(3) But Town-sweepings gave almost as much or slightly more net profit than Farm yard manure. This was due to the fact that Town-sweepings were comparatively cheaper than Farm yard manure.

These results of the experiments show that the manure supply in the transition tract can be profitably supplemented by Poudrette and Town-sweepings. Every town has its own Municipality and it is worth its while to prepare Poudrette from night soil on systematic lines and also preserve the Town-sweepings carefully and make these two kinds of bulky manures available to the cultivators for application to their crops.

BOMBAY : PRINTED AT THE GOVERNMENT CENTRAL PRESS.

Gratis [FIRST EDITION]

Department of Agriculture, Bombay.

LEAFLET No. 11 of 1928.

LIVE-STOCK SECTION EXTENSION SERVICE.

"THE TICK PROOF PERCH."

India from every point of view is ideal for the raising of poultry, and there is no reason why poultry farming should not be a profitable business. In India we have plenty of cheap foodstuffs, the great essentials to cheap poultry production.

The Indian Poultry Farmers' greatest enemy is the several forms of tick that abound in India, and infest all poultry houses, never mind, how they may be built.

The tick that does the greatest damage does not live on the birds. It lives in cracks, crevices, over-lapping iron sheets, between joints or any dark cover it can get during the day. At night it leaves its hiding place and attacks the fowls. They abound in all fowl houses in thousands and one can easily imagine what damage such a number can do, even if each was content with one drop of blood.

When it is suggested that ticks are the cause of most poultry ills, the usual answer is that I have examined all my birds and there are no ticks, and furthermore I see my fowl house cleaned and washed with some disinfectant daily, so ticks are not my trouble. An easy way to ascertain if your fowl house is tick-infected is, when you lock your birds up for the night drop a gunny bag, piece of flannel or a glove on the floor of the fowl house. On examining this next day, you will be surprised to see the wonderful catch you have made. Fortunately the habits of these dangerous ticks are such that we can prevent them from getting at the birds by erecting in the fowl house what is known as a "Tick Proof Perch." All poultry except ducks and geese, perch, regardless of their weight. Their natural method of rest is sitting on a perch and not on the ground. If allowed to sit on the ground, there is not only the danger from attack of ticks but there is a likelihood of suffocation, as the birds huddle together and the weaker ones if in the middle may get suffocated. And again by being huddled up their tails may get permanently bent and you get birds with a wry tail. The perch should be long enough to allow 9 inches for each bird ; it should not be more than 18 inches to two feet off the ground. Jumping from high perches induces bumble-foot or a corn-like swelling of the sole of the foot.

MO Q 54

The perch should be so placed in the house that the birds do not touch the sides of the house, for, if they do, the tick will crawl along the wall and then get on to the feathers and so on until it gets at the flesh of the bird.

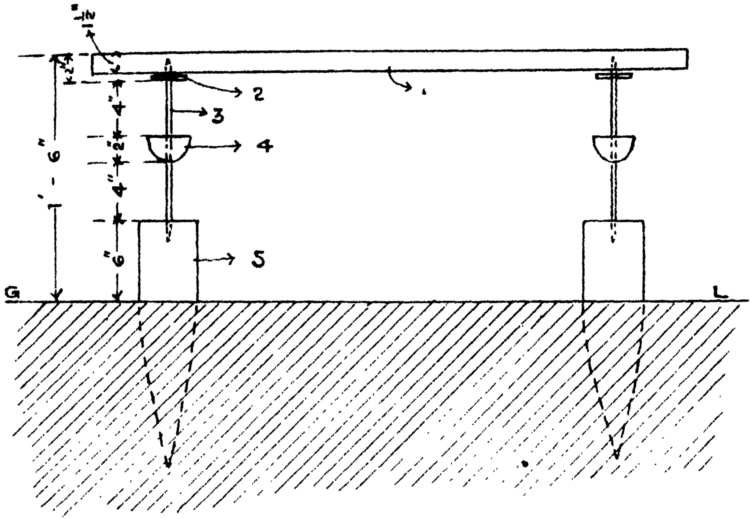
A tick proof perch consists of a cup, made of brass, iron or tin, through the centre of which is passed a round iron rod, which is soldered to the vessel to make it water-tight, the bottom end of the rod is placed in the ground and the perch rests on the other, the cup is filled with oil. The bottom end of the rod may ~~be bent and~~ put into the wall, but putting it into the ground is preferable.

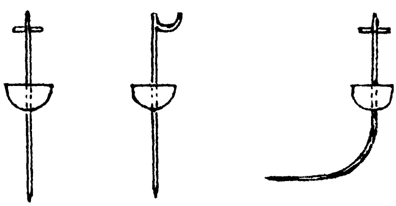
Any oil can be used in the perch, but black thick oil soils the feathers of birds, it dries quickly leaving a thick scum, which the tick can walk over. Examine your perches and see that the cups are full of oil; kerosene oil is the best.

The diagram shows how a tick proof perch is made, it only costs a few annas and it saves much money in deaths, worry and trouble.

BOMBAY: PRINTED AT THE GOVERNMENT CENTRAL PRESS.

THE TICK PROOF PERCH





6 7 8

1 WOOD PERCH.	6 IRON ROD.
2 PERCH SUPPORT.	7 ,, ANOTHER TYPE.
3 IRON ROD.	8 ,, FOR USE IN THE WALL.
4 TIN, IRON OR BRASS CUP.	
5 WOODEN PEG.	

Scale 1 Foot to an inch.